1991

Modeling Sediment Resuspension in Lower Chesapeake Bay

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MODELING SEDIMENT RESUSPENSION
IN LOWER CHESAPEAKE BAY

A Thesis

Presented to

The Faculty of the School of Marine Science

The College of William and Mary in Virginia

In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

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by

Deborah L. Linden

1991

This thesis is submitted in partial fulfillment of

the requirements for the degree of

Master of Arts

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Approved, December 1991

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ACKNOWLEDGMENTS

I wish to express my gratitude to my co-major advisors, Dr. L.D. Wright and Dr. S.M. Kimball, for their guidance, insight, and constructive suggestions throughout this work. I especially appreciate Dr. Wright's skillful explanations regarding details of the numerical model. I owe many thanks to Dr. Kimball for providing me with a computer and printer, enabling me to complete much of this work in Charlottesville. I also wish to thank my other Advisory Committee members, Dr.'s J.D. Boon, J.P.-Y. Maa, and L.C. Schaffner, for their constructive reviews of this manuscript. I especially thank Dr. Boon for his many helpful discussions.

Successful completion of this work would not have been possible without the patience, support, and many words of encouragement provided by my husband, Dean. To him, I express sincere appreciation and undying love. I also wish to thank my parents for their constant understanding, encouragement, and love, for which I am forever grateful.

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LIST OF SYMBOLS

A_b	wave excursion amplitude
C_m	mass coefficient
C_r	coefficient relating U_{*cw} to U_{*wm}
C^*	areal concentration
D	mean sediment diameter
f_w	wave friction factor
g	acceleration due to gravity
h_t	maximum thickness of near-bed sediment transport layer
Hmo	zero-moment wave height
k	von Karman's constant
k_b	skin friction roughness
k_{fd}	form drag roughness
k_{br}	ripple roughness
k_{bi}	biological roughness
k_{mb}	moveable bed roughness
k_T	total bed roughness
k_o	deep water wave number
l	Prandtl's mixing length
L	length scale of the wave boundary layer
L_o	deep water wavelength
R_*	grain Reynolds number
S_*	dimensionless sediment parameter
T_p	peak spectral wave period
U_b	orbital velocity
U_*	shear velocity
U_{*cw}	wave-current shear velocity
U_c	current velocity
U_{*c}	current shear velocity
U_{*wm}	maximum wave shear velocity
$U_{*cw(f)}$	wave-current skin friction shear velocity
z	elevation above bed
z_o	hydraulic roughness length
z_{oc}	increased roughness experienced by current in combined flow cases
δ_{cw}	wave boundary layer thickness in combined flow cases
ϵ	viscisity (eddy and molecular)
ϕ	angle made between waves and current
λ	ripple length
η	ripple height
ν	kinematic viscisity of water
ω	wave frequency
ρ	density
ρ_s	sediment density
θ	Shields parameter
θ_c	critical Shields parameter
θ'	Shields parameter based on the skin friction
θ_B	Shields parameter for ripple breakoff
τ	shear stress
τ_o	bed shear stress
τ_c	critical shear stress
τ_{sf}	skin friction shear stress
τ_{fd}	form drag shear stress
τ_{cw}	wave-current shear stress
τ_{wm}	maximum wave shear stress
τ'	wave shear stress based on skin friction

ABSTRACT

The resuspension of bed sediments by natural physical processes was modeled from October, 1988, to October, 1989, for Thimble Shoals, an estuary mouth shoal environment of Lower Chesapeake Bay. A numerical model which considers the interaction of waves and currents in shallow environments, was used to estimate seabed shear stresses. Some portions of the total bed roughness (skin friction and biological roughness) were derived from field data, while ripple roughness and moveable bed roughness were model-estimated as functions of the boundary shear stress. Resuspension was calculated using an empirically derived equation based on the excess Shields Parameter. The results from the model indicate the potential for relatively constant reworking of the Thimble Shoals bed by sediment resuspension. The bed is likely reworked the most during times of major local winter storms (northeasters), and during times when major hurricanes pass close to the mid-Atlantic Bight region. Intermediate amounts of bed reworking were predicted for non-storm periods during fall, winter, and spring months. During summer months, the bed likely remains undisturbed by natural physical processes a large percentage of the time; however, reworking by benthic organisms may be greatest at this time.

The portions of the total predicted resuspension associated with two wave energy sources ("sea waves" and "bay waves") in Lower Chesapeake Bay were also modeled. Bay waves are locally generated, while sea waves are generated external to the Bay. Model results indicate that sea waves are responsible for a majority of the predicted bed reworking year-round. This contrasts the previously held belief that only bay waves contribute significantly to sediment resuspension in Lower Chesapeake Bay.

MODELING SEDIMENT RESUSPENSION

IN LOWER CHESAPEAKE BAY

INTRODUCTION

Sediment resuspension is a process occurring at the seabed which is crucial to understanding many characteristics of the existing bottom environment. The resuspension of bed sediments physically disturbs the bed and the resident benthic community, and provides for the exchange of oxygen, nutrients, and pollutants between the water column and the bed. Recently, estuarine bed environments have been subject to increasing alteration by human activities such as dredging and disposal. These activities lead to the destruction of benthic communities and to the addition of polluted material to the estuary floor. Because sediment resuspension is a strong determinant of benthic community structure, as well as of the transport and fate of pollutants, an ability to accurately predict sediment resuspension should allow for better assessments of the potential impacts of dredging and disposal activities. Successful modeling of sediment resuspension should augment many facets of benthic research.

Sediment resuspension is a process which depends on the friction generated between flows above the seabed and the bed itself. That frictional force is expressed as a bed shear stress, τ_o. The bed shear stress is a parameter which cannot be measured directly *in situ*, but may be derived using velocity profiles, or estimated using a numerical model. When flows are sufficient such that a critical bed shear stress is reached, sediment motion at the bed may be initiated. Thus, for successful modeling of processes such as sediment resuspension, accurate models for predicting the boundary shear stresses are an important first step (Grant and Madsen, 1982).

In shallow coastal environments such as those of many estuaries, there are two aspects which a model for estimating bed shear stress must include. The first has to do with the combined presence of surface waves and currents which governs many of the physical processes affecting the bed in shallow environments (Grant and Madsen, 1979). In such environments, both wave motions and current motions will extend down to the seabed and interact with the bed to generate a combined τ_o. Generally, the most significant occurrences of sediment motion will be when the mean flow is enhanced by wave motion (Dyer, 1986). Waves will exert direct frictional effects on the bed, and also enhance the shear stresses exerted by mean current (Wright, 1989). Thus, models of boundary shear stress in estuarine environments should consider a combination of both wave and current processes.

The second factor which must be incorporated into a model for estimating seabed shear stress in the estuarine environment is accurate specification of the bed and substrate characteristics (i.e., bed roughness). In shallow environments, both the hydrodynamics and the bed roughness interact in order to determine the friction generated. The total bed roughness includes that due to the sediment grains on the bed (skin friction roughness, k_b), physical obstructions to the flow such as flow-induced bedforms or biogenic elements (form drag roughness, k_{fd}), and that due to a near-bed sediment transport layer (moveable bed roughness, k_{mb}). Skin friction roughness and the biogenic portion of form drag roughness may be easily estimated from field data, the remaining portions of the total bed roughness; however, must be model estimated. Once total bed roughness and the combined bed shear stress have been estimated, sediment resuspension may be modeled.

Physical processes occurring near the seabed such as sediment resuspension, are typically subject to significant spacial and temporal variability, especially in shallow estuarine environments (Wright, 1989). In lower Chesapeake Bay for example, Wright et al. (1987) described 10 different bottom types based on spatially varying roughness characteristics and each associated with a particular subenvironment. Processes such as sediment resuspension will exhibit these same spacial patterns of variability mirrored by the bed itself (Wright et al., 1987). There also exists, in lower Chesapeake Bay, variability in the energy conditions which affect the bed. This arises from the presence of a dual wave energy source (Boon et al., 1990). The two wave energy components correspond to waves generated locally with a southerly direction of wave advance, and waves generated external to the Bay with a west to west-northwest direction of wave advance (Boon et al., 1990). In the past, it was thought that only the locally generated waves contributed significantly to sediment resuspension in Chesapeake Bay. Recent evidence; however, (i.e., Boon et al., 1990) indicates that a major fraction of wave energy affecting lower Bay benthic regions year-round may likely be associated with waves generated external to the Bay (Boon et al., 1990).

This study seeks to model local sediment resuspension in the Thimble Shoals region of lower Chesapeake Bay (Figure 1) over the year October, 1988, to October, 1989. Thimble Shoals was chosen because it represents one of the 10 subenvironments described by Wright et al. (1987), (the estuary mouth shoal subenvironment), and because recent research at Thimble Shoals has produced a large database which can be applied to the problem of sediment resuspension. Total resuspension is modeled, as well as those portions of the total resuspension which are associated with the two main wave energy components affecting the site.

Statement of problem

The main problem sought to be addressed by this research was that of modeling sediment resuspension in response to natural physical processes. This problem was identified because of its importance in determining benthic community structure and transport and fate of pollutants, and its likely importance in better understanding potential impacts of dredging and disposal activities. In these cases, information regarding both the frequency with which sediment is resuspended and the magnitudes to which it is resuspended will be useful. Extreme events, for example, may mobilize very large amounts of sediment over relatively short periods of time. Such events; however, are typically rare. Thus, it is also important to consider those events which affect the bed most often. These events will strongly determine the typical condition of the bed. This study thus sought to model sediment resuspension with respect to both frequency and magnitude. Because resuspension is sensitive to grain size, modeling was done using the mean grain size, as well as characteristic coarse and fine grain sizes.

Objectives

1. To model the local resuspension at Thimble Shoals over the year October, 1988, to October, 1989, in terms of:

a)frequency of sediment resuspension

b)magnitude of sediment resuspension

c)characteristic coarse, mean, and fine, grain sizes of Thimble Shoals sediments.

2. To model the isolated portions of the total resuspension associated with two main wave energy components ("bay waves" and "sea waves"), in terms of:

a)frequency of resuspension

b)magnitude of resuspension

3. To compare the model predicted ripple dimensions to observed ripple dimensions in order to evaluate the appropriateness of the boundary roughness model.

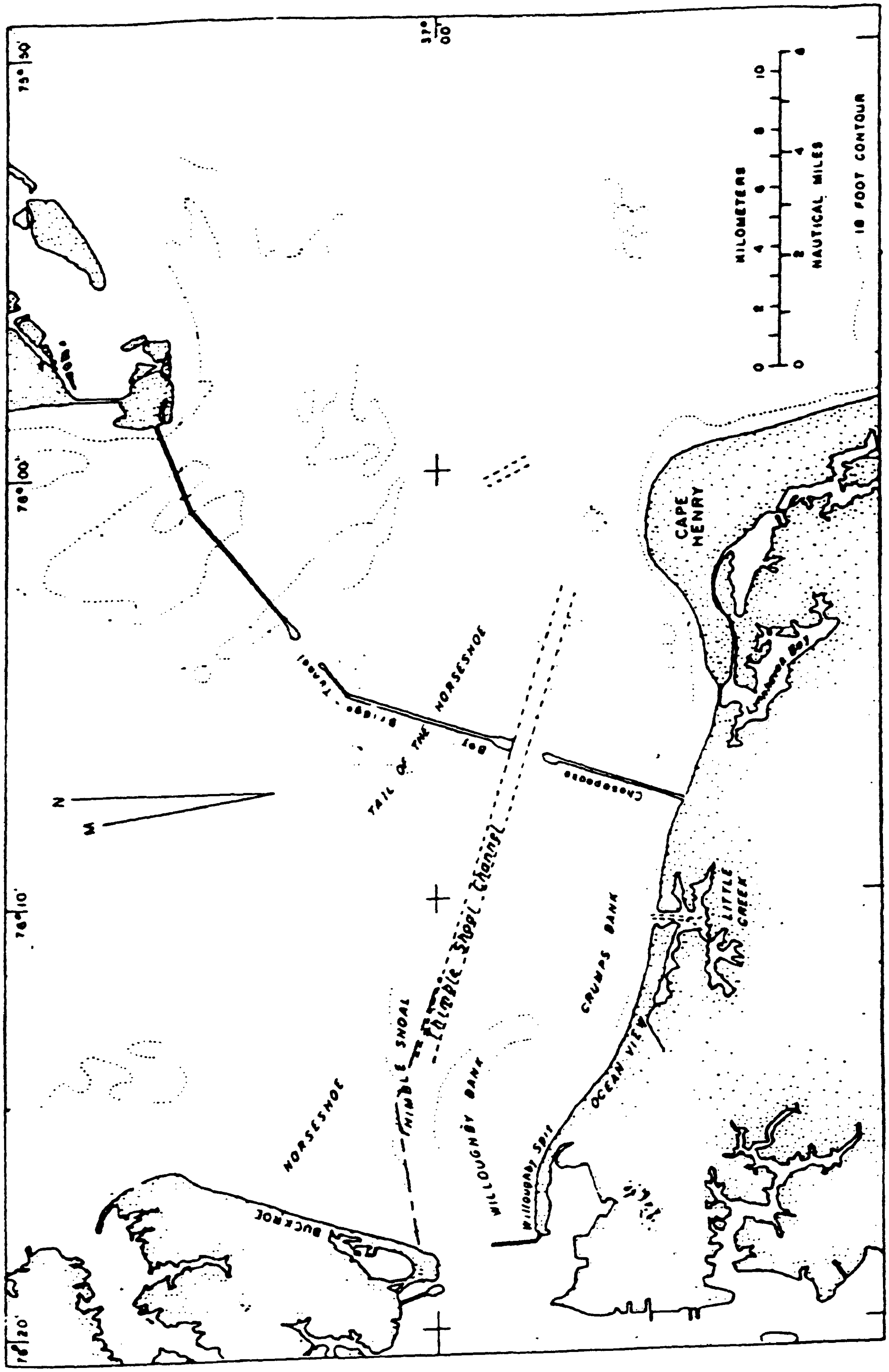


Figure 1. Location of the Thimble Shoals region of lower Chesapeake Bay.

The research questions underlying these objectives and focused on determining the net effect of the frequency and magnitude of resuspension were: "When during the year is the bed reworked the most by sediment resuspension due to natural physical processes?", and "Which wave energy component reworks the bed the most?".

The hypotheses generated in this study were based on a description provided by Boon et al. (1990) of the lower Chesapeake Bay wave climate. Their description was based on actual wave and current measurements taken within the lower Chesapeake Bay. They state that during fall and winter months, of the waves measured with significant heights greater than 0.60 m, almost all were southerly directed, thus being of local origin. The largest wave heights observed year-round were also mainly associated with waves generated inside the bay. Of the waves in the mid-range of heights (0.20 m - 0.60 m), these were directed west to northwest greater than 50% of the time during fall and winter months (thus being of external origin). During summer months, intermediate height waves were generated external to the bay approximately 80% of the time, while locally generated waves reached only minimal heights. Thus, the external wave energy component was present year-round, generating waves of small to intermediate heights, while waves generated locally were larger in height during fall and winter months and smaller in height during the summer. Based on this description, the following hypotheses were formed:

<u>Hypotheses</u>

1. As predicted from modeling, the most frequent sediment resuspension will be during fall/winter months, and the least frequent sediment resuspension will be during spring/summer months. For this study, fall/winter months will include September through March, and spring/summer months will include April through August.

2. The greatest magnitudes of sediment resuspension will be during

fall/winter months, and the smallest magnitudes of sediment resuspension will occur during spring/summer months.

3. The "sea wave" energy component will resuspend bed sediments most frequently year-round, but will resuspend the smallest magnitudes of sediment.

4. The "bay wave" energy component will resuspend bed sediments least frequently year-round, but will resuspend the greatest magnitudes of sediment.

BACKGROUND

Bottom Boundary Layer theory

Because this study addresses aspects of fluid motion near a bed, and its interaction with and effect on bottom sediments, it is essential to understand the dynamics of the region in which these interactions take place. Within the water column, this region of complex interactions is known as the Bottom (or Benthic) Boundary Layer (Nowell, 1983; Wright, 1989; Grant and Madsen, 1986; Soulsby, 1983; Dyer, 1986). As Wright et al. (1990) note, the Bottom Boundary Layer (BBL) is the main link between water movement and sediment movement. It is the interface within which sediment particles, chemicals, and organisms are exchanged between the water column and the bed (Grant and Madsen, 1986).

Within the BBL, the main means of interaction between the sediment in the bed and the flow above the bed is by friction forces (Wright, 1989). A friction force may also be thought of as a momentum transfer rate - thus, one may view the interactions which occur between the sediment and the fluid as occurring via the exchange of momentum between the fluid and the bed, and between successive fluid layers (Wright, 1989). This exchange may be provided by either turbulence (random, quickly changing movements), or by molecular viscosity (slow, stabilizing exchanges).

The transfer of momentum which takes place within the BBL is expressed as a shear stress, τ, (Wright, 1989). A shear stress is defined as a frictional force per unit area and is proportional to the viscosity and to the velocity gradient (Wright, 1989): $\tau = \rho\ \epsilon(du/dz)$, where ϵ represents both eddy and molecular viscosity, ρ is density,and du/dz represents the velocity gradient. For fully turbulent flows, molecular viscosity may be neglected. The bed shear stress, τ_o, is of particular importance in moving sediment particles off the bed (Wright, 1989; Dyer, 1986; Soulsby, 1983). If the bed shear stress exceeds a certain threshold value, τ_c, then sediment motion will be initiated.

It is important to note that the total bed shear stress may be assumed to be the sum of a skin friction shear stress and a form drag shear stress (Wright, 1989; Vincent and Green, 1990; Dyer, 1986), i.e., $\tau_o = \tau_{sf} + \tau_{fd}$. It is the skin friction shear stress alone that is responsible for sediment resuspension, while form drag shear stress is due to physical obstructions to the flow, such as flow induced or biogenic bedforms (Wright, 1989; Vincent and Green, 1990; Dyer, 1986). These physical obstructions add resistance to the flow. The skin friction shear stress is that part of the total stress which is actually applied to the sediment particles; the effect of form drag shear stress is to reduce the space-averaged skin friction shear (Chriss and Caldwell, 1982). Thus, for a given total bed shear stress, an increase in form drag may cause a decrease in skin friction and a reduction in the capacity of the flow to transport sediment (Dyer, 1986).

Another way of looking at sediment entrainment is as a ratio of 2 forces - that is, a force working to move sediment grains on the bed vs. a force working to keep the particles in place. This ratio may be expressed by the Shields parameter, θ,:

$$\theta=\frac{\tau}{(\rho_s-\rho)gD} \qquad (1)$$

where ρ_s is the sediment density, g is the acceleration due to gravity, and D is the mean diameter of the bed sediments. Basically, the Shields parameter compares the shear stress with the immersed weight of a layer of the bed of a unit grain thickness (Dyer, 1976). The shear stress is the dragging force trying to move the sediments, while the weight of a layer of the bed is the resisting force trying to keep the sediments in place. The critical Shields parameter, θ_c, represents the point at which the critical shear stress, τ_c, necessary to initiate sediment motion is exceeded.

For research focused on sediment motion at the bed, the successful prediction of bed shear stress is of utmost importance, as τ_o dominates the dynamics near the bed. For fully turbulent boundary layers, τ_o is related to the shear velocity, U_*, by: $\tau_o = \rho U_*^2$, where U_* is a function of the velocity gradient (du/dz) such that $U_* = kz(du/dz)$, (Wright, 1989; Dyer, 1986). Here, k is von Karman's constant (k~0.41), and the product kz is known as Prandtl's mixing length, *l*, which typically represents the length scale of turbulent eddies causing momentum transfer within the BBL (Dyer, 1986). It is important to note that the above relationships apply only within the logarithmic layer of fully turbulent boundary layers. For fully turbulent flows, the logarithmic layer is that portion of the BBL within which the velocity profile is logarithmic with elevation above the bed (Soulsby, 1983; Dyer, 1986). Eddy viscosity is the main means of momentum exchange within this layer, and the local shear stress is constant with height (Soulsby, 1983; Dyer, 1986).

One very well-known relationship which is commonly used in the prediction of τ_o is the von Karman-Prandtl relation, also known as "the law of the wall". This equation relates the shear velocity, U_*, the local mean flow velocity, U, and the hydraulic roughness length, z_o, (conceptually, the height above the bed at which U=0), within the logarithmic layer of fully turbulent bottom boundary layers. The von Karman-Prandtl equation is:

$$\frac{U}{U_*}=\frac{1}{k}\ln\frac{z}{z_o} \tag{2}$$

(Dyer, 1986; Wright, 1989; Soulsby, 1983). To use this relation in the prediction of τ_o, the velocities measured from at least four different elevations above the bed and within the logarithmic layer, are plotted against ln z (the natural log of the elevation at which the velocities are measured). Then, generally a least squares regression is done to obtain U_* (and hence τ_o) from the slope, and z_o from the intercept (Dyer, 1986; Soulsby, 1983; Grant and Madsen, 1986).

The (true) hydraulic roughness length, z_o, as was mentioned previously, is conceptually where U=0. For an ideal case, without modifying factors and for a uniform grain size bed, the size of the sediment particles will be the main determinant of z_o. In this case, $z_o = k_b/30$, where k_b is the skin friction roughness expressed as k_b=2.5 D, and D=sediment grain diameter (Dyer, 1986; Wright, 1989). Because there are almost always complicating effects present in nature, a more complete expression for z_o may be used such that $z_o = k_T/30$, where k_T represents the total or effective bed roughness (Wright, personal communication). This total bed roughness includes not only the skin friction roughness k_b due to the sediment grains, but also a form drag roughness k_{fd} which can be due to either flow-induced or biogenic bedforms (k_{br}=ripple roughness, k_{bi}=biological roughness), and a moveable bed roughness k_{mb} due to near-bed sediment transport (Grant and Madsen, 1982). Near-bed sediment transport will occur when the critical bed shear stress necessary for sediment transport is exceeded. With increasing bed shear stress beyond the critical, an increasing amount of sediment may be lifted into the flow, and ripples which initially develop may eventually be replaced by a flat bed. Thus, as k_{mb} increases, k_{br} (and hence k_{fd}) may be reduced.

While the "law-of-the-wall" is well established in the literature, it can often be misleading. Many factors such as the presence of waves, the nature of the bottom topography, sediment transport, accelerating or decelerating flow, and stratification will all affect the velocity profile causing the apparent z_0 and U_* to differ from what would otherwise be estimated (Dyer, 1986; Soulsby, 1983; Wright, 1989). Some researchers, such as Grant and Madsen (1979;1986), have developed "modified law-of-the-wall" models to help deal with some of these modifying factors. Grant and Madsen's (1986) model accounts for the effects on τ_0 and z_0 caused by the presence of waves. Their model was used in the first portion of this analysis to determine the shear stresses at a site whose hydrodynamics are characterized by combined waves and currents.

Waves are important to bottom boundary layer dynamics, especially in shallow environments such as those of the continental shelf and many estuaries (Wright, 1989). Dyer (1986) states that in these shallow regions, it is likely that the most significant occurrences of sediment motion at the bed will occur when current motion is enhanced by wave motion. Typically the wave orbital velocity near the bed can produce a much greater shear stress than an equivalent current velocity. This is because of the small scale of the wave boundary layer relative to that of the current boundary layer, and thus the steeper vertical velocity gradient and resulting shear stress associated with the wave. Waves may thus act as an effective stirring mechanism, creating sediment suspension, while steady currents may then produce net sediment transport (Dyer, 1986; Grant and Madsen, 1979).

Situations of combined waves and currents cause two boundary layer (BL) regions to develop. A wave BL exists very near to the bed and is typically only a few centimeters in thickness (Wright, 1989). The wave BL is embedded in a current BL which is on the order of meters in thickness

(Wright, 1989). Consequently, the presence of the wave BL will cause the current boundary layer to experience an increased roughness. This increased roughness will depend not only on the physical bottom roughness, but also on the wave boundary layer characteristics (Dyer, 1986; Wright, 1989; Grant and Madsen, 1979). Thus, the current will feel a greater resistance due to the wave. The velocity profile associated with the wave-influenced current will be steeper than that of a current with no wave influence due to the increased resistance (Grant and Madsen, 1979). The ability to account for the wave influence on the current velocity profile is important in order to accurately calculate bed shear stresses in environments of combined waves and currents.

Grant and Madsen wave and current boundary layer model

Grant and Madsen (1979; 1986) have developed a model that considers both wave and current motions near the bottom, and treats their interaction as non-linear. In their model, the waves and currents each act to enhance one another. The non-linear interaction results in a combined wave-current shear stress, τ_{cw}, which is different from that which would be estimated from simple addition of the current shear stress alone and the wave shear stress alone. Similarly, the wave-current shear velocity, U_{*cw}, is due to the enhanced wave and current contributions and does not result from simple addition of the current shear velocity and the wave shear velocity.

Within the wave BL, both waves and currents contribute to turbulence, while above this layer, the current is the only contributor to the turbulence (Grant and Madsen, 1986). Above the wave boundary layer, the velocity profile may be expressed by the von Karman-Prandtl equation, however, an increased roughness parameter must be used to account for the increased roughness experienced by the current due to the presence of the waves. The resulting equation is:

$$U_c=\frac{U_{*c}}{k}\ln\frac{z}{z_{oc}} \tag{3}$$

where z_{oc} is the increased roughness experienced by the current. It is increased over that which would be expected if no waves were present as it is based on the physical bottom roughness as well as the wave characteristics. The major influence of the wave on the current, above the wave BL, is thus reflected through the apparent roughness z_{oc}.

Within the wave BL, the velocity profile is given by:

$$U_c=\frac{U_{*c}}{k}\left(\frac{U_{*c}}{U_{*cw}}\right)\ln\frac{z}{z_o} \tag{4}$$

(Grant and Madsen, 1986). Here, z_o is simply the physical bottom roughness. In this equation, it can be seen that the current velocity, U_c, is modified by U_{*c}/U_{*cw} . This term is always <1, (since waves and currents existing jointly each act to enhance one another, the combined wave and current shear velocity will always be greater than the pure current shear velocity). Based on these expressions of the velocity profiles for both regions of the combined wave-current BL, it can be seen that the current velocity at any elevation will always be less in the presence of waves. The net effect is such that more resistance is applied to the current flow when influenced by waves (Grant and Madsen, 1986).

Grant and Madsen (1986) offer simple equations, which were used in this analysis, for the calculation of the characteristic shear velocities (and hence shear stresses) within the wave-current boundary layer. The maximum wave shear stress, τ_{wm}, is obtained such that:

$$U_{*wm}{}^2=\frac{\tau_{wm}}{\rho}=\frac{kU_{*cw}U_b}{((\ln\frac{kU_{*cw}}{z_o}-1.15)^2+(\frac{\pi}{2})^2)^{\frac{1}{2}}} \tag{5}$$

This equation shows that the current affects the wave stress through U_{*cw}. Another way of representing the maximum wave shear stress is:

$$U_{*wm}=(\frac{\tau_{wm}}{\rho})^{\frac{1}{2}}=(C_r)^{\frac{1}{2}}(\frac{f_w}{2})^{\frac{1}{2}}U_b \tag{6}$$

where C_r is a coefficient relating U_{*cw} to U_{*wm}: $C_r=(U_{*cw}/U_{*wm})^2$, and f_w is a wave friction factor.

The local current velocity, U_c, is given by:

$$U_c=\frac{U_{*c}}{k}(\frac{U_{*c}}{U_{*cw}}\ln\frac{\delta_{cw}}{z_o}+\ln\frac{z}{\delta_{cw}}) \tag{7}$$

where δ_{cw} is the wave BL thickness for cases of combined waves and currents and is given by: $\delta_{cw} = 2(L)$, (Grant and Madsen, 1986). Here (L) is the length scale of the region over which the shear stress associated with the waves is expected to be important, and is expressed as $L=(kU_{*cw})/\omega$, (Grant and Madsen, 1979). Thus, the thickness of the wave BL is limited by the wave frequency ω, (longer period, lower frequency waves will produce a thicker wave BL). The wave BL thickness is important to consider in determining local current velocity since the wave BL itself is a roughness element to the steady current. It is evident from the equation above for the local current velocity, that its value will decrease as the wave motion (and hence U_{*cw} and δ_{cw}) increases (Grant and Madsen, 1986).

Rearranging equation 7 and solving for U_{*c} gives:

$$U_{*c}=\frac{-\ln\frac{z}{\delta_{cw}}+\sqrt{\left(\ln\frac{z}{\delta_{cw}}\right)^2+4\left(\frac{\ln\frac{\delta_{cw}}{z_o}}{U_{*cw}}\right)(kU_c)}}{\frac{2\left(\ln\frac{\delta_{cw}}{z_o}\right)}{U_{*cw}}} \quad (8)$$

Through this equation, it can be seen that the wave affects the current stress through U_{*cw} and through δ_{cw} (the thickness of the wave BL for combined flows). This equation also demonstrates that the mean current velocity, U_c, is the physical parameter responsible for developing the near-bottom current shear.

For the combined wave-current shear velocity, Grant and Madsen's (1986) model takes into account the angle made between the waves and the current, ϕ, such that:

$$U_{*cw}=U_{*wm}\left(1+2\left(\frac{U_{*c}}{U_{*wm}}\right)^2\cos\phi+\left(\frac{U_{*c}}{U_{*wm}}\right)^4\right)^{\frac{1}{4}} \quad (9)$$

Some influence of the wave (U_{*wm}) on the current (U_{*c}) is always present, but this influence diminishes as U_{*c} becomes large relative to U_{*wm} and as the angle between the waves and the current increases (Grant and Madsen, 1979). This equation also demonstrates the relatively greater role played by the maximum wave shear velocity in developing the combined wave-current shear velocity.

Upon viewing equations 5 and 9, it may be noted that a situation exists in which U_{*cw} is needed to solve for U_{*wm}, while U_{*wm} is needed to solve for U_{*cw}. In order to solve these two simultaneous equations, an iterative procedure is used. To begin, the parameter C_r is assigned an initial value and equation 6 is solved. The resulting value for U_{*wm} is then used to solve for U_{*cw}, again using the coefficient C_r and the relation: $C_r=(U_{*cw}/U_{wm})^2$. The resulting value for U_{*cw} is used to solve for δ_{cw}, and subsequently for U_{*c} by equation 8. Equation 9 is then solved obtaining a new value for U_{*cw}, which is used to obtain an improved estimate of C_r, with which the procedure is repeated. The iteration procedure continues until sufficiently improved estimates of the parameters are obtained.

<u>Grant and Madsen model for predicting boundary roughness</u>

It is well known that the shear stresses developed within the bottom boundary layer depend upon the roughness of the boundary. Thus, as accurate models of the boundary shear stress are important to studies involving sediment transport, it is also critical that accurate specification of the bed roughness be incorporated into these models.

The procedure used in this study to estimate bed roughness is based on Grant and Madsen's (1982) model (hereafter GM82) to predict roughness in unsteady oscillatory flows over movable noncohesive beds. Their model predicts both the ripple dimensions (height (η), and length (λ)), and the boundary roughness as functions of the boundary shear stress, rather than as a constant set by a fixed roughness geometry as earlier fixed bed roughness models were designed (ie: Smith and McLean, 1977). Their model is based on a bed of uniform grain size sediments. Though ripple dimensions are best determined from actual bottom observations, these are often not available and thus empirical relationships must be used for their prediction. This analysis used GM82's equations, described in this section, for the determination of ripple dimensions and total bed roughness based on field-collected wave and current data.

Ripples start to form on a seabed as the friction at the bed increases from conditions just sufficient to initiate sediment motion (GM82). Grant and Madsen partition the subsequent bed roughness into two contributions, or two distinct ranges of ripple growth and decay - the equilibrium range and the breakoff range. Within the equilibrium range, the roughness is due to the form drag around individual bedforms. The steepness of the ripples, η/λ, formed in this range is near a maximum, and the ripple length is in equilibrium with the wave excursion amplitude, A_b, (GM82). Within the breakoff range, the bed friction increases beyond that at the equilibrium range and a decrease in ripple steepness occurs which is associated with a lower ripple height (GM82). The ripple length and the wave excursion amplitude are no longer in equilibrium and the roughness becomes predominantly due to the near-bed sediment transport (i.e., moveable bed roughness).

Within the breakoff range, the ripples may become obliterated by the flow for sufficiently large values of the boundary shear stress. The near-bed sediment transport rate will thus be high, in contrast to the equilibrium range when relatively lower values of boundary shear and of sediment transport occur (GM82). Because the conditions at the bed change as a function of the friction at the bed and the resulting shear stress, GM82 explain that the total bed roughness should thus be determined based on the skin friction bed shear stress. The geometry of the ripples formed should also be estimated as a function of the skin friction shear, and should be used in determining the ripple roughness portion of the total boundary roughness (GM82).

GM82 found the parameter θ'/θ_c to be useful in characterizing the behavior of the ripples and the subsequent sediment transport. They found the ripple steepness to be nearly independent of θ'/θ_c within the equilibrium range. As ripples decay, however, η/λ becomes more dependant on θ'/θ_c, and as sediment transport increases, θ'/θ_c increases as well (GM82). The empirically derived relationships for ripple geometry given by GM82 and used in the analysis of this study are presented in Table 1.

The parameter θ'/θ_c is the ratio of the maximum value of the Shields parameter based on the skin friction to the critical value necessary for initiation of sediment motion. In this analysis, θ_c is determined from the Shields curve, and θ' is given by:

$$\theta' = \frac{\tau'}{\rho\,(\frac{\rho_s}{\rho}-1)\,gD} \qquad (10)$$

where τ' is the maximum wave shear stress based on the skin friction (GM82).

Using the parameter θ'/θ_c, GM82 describe an empirically derived expression for the breakoff point between ripple roughness and moveable bed roughness:

$$\left(\frac{\theta'}{\theta_c}\right)_B = 1.8S_*^{0.6} \qquad (11)$$

in which B denotes the breakoff point and S_* is a dimensionless sediment parameter (Madsen and Grant, 1976) given by:

$$S_* = \frac{D}{4\nu}\sqrt{(\frac{\rho_s}{\rho}-1)\,gD} \qquad (12)$$

Table 1. Empirical Relationships for Ripple Geometry Under Waves

	Equilibrium Range	Breakoff Range
	$(\theta'/\theta_c)<(\theta'/\theta_c)_B$	$(\theta'/\theta_c)>(\theta'/\theta_c)_B$
η/A_b	$0.22(\theta'/\theta_c)^{-0.16}$	$0.48S_*^{0.8}(\theta'/\theta_c)^{-1.5}$
η/λ	$0.16(\theta'/\theta_c)^{-0.04}$	$0.28S_*^{0.6}(\theta'/\theta_c)^{-1.0}$

From Grant and Madsen, (1982).

where ν is the kinematic viscosity of water (0.01 cm^2/sec), ρ_s is the sediment density, ρ is the density of water, g is the acceleration due to gravity, and D is the mean sediment grain diameter.

The ripple roughness, k_{br}, is expressed by GM82 in terms of the ripple geometry. It is proportional to the product of ripple steepness and ripple height:

$$k_{br}=27.7(\eta)(\frac{\eta}{\lambda}) \tag{13}$$

GM82 also derive an expression for the roughness of the near-bed sediment-transport layer (k_{mb} - moveable bed roughness), in which K_{mb} is related to the thickness of this layer. The maximum thickness, h_t of the near-bed transport layer is given by:

$$h_t=(\frac{e^2}{2})(\frac{\rho_s}{\rho}+C_m)D\theta_c((\frac{\theta'}{\theta_c})^{\frac{1}{2}}-b)^2 \tag{14}$$

in which e is a proportionality constant, and b = e_c/e, where e_c is a proportionality constant for the initiation of sediment motion (GM82). C_m is a mass coefficient which, assuming all particles to be spherical, C_m = 1/2. Kobayashi (1979) found e=9.2 and b=0.7 in an experimental analysis for unidirectional flow. GM82 assume these values to be reasonable estimates and use them to simplify equation 14 to:

$$h_t=42(\frac{\rho_s}{\rho}+\frac{1}{2})D\theta_c((\frac{\theta'}{\theta_c})^{\frac{1}{2}}-0.7)^2 \tag{15}$$

The moveable bed roughness is then given by:

$$k_{mb}=3.8(h_t) \tag{16}$$

Though their model was developed for the case of waves only, the authors argue that it can be used to calculate roughness for the combined (wave and current) flow case. Evaluation of the Shields parameter based on skin friction, θ', must be done using Grant and Madsen's (1986) wave-current boundary layer model. In the analysis performed in this study, the combined wave and current skin friction shear velocity, $U_{*cw(f)}$, was used to evaluate θ' such that:

$$\theta' = \frac{(U_{*cw(f)})^2}{(\frac{\rho_s}{\rho}-1)\,gD} \qquad (17)$$

The skin friction shear velocity, $U_{*cw(f)}$, is calculated using Grant and Madsen's (1986) wave-current boundary layer model (based solely on the skin friction roughness, i.e., k_b=2.5 D, and z_o=k_b/30). In the case of combined flow, the boundary shear stress is enhanced over that due to waves alone. Thus, if the maximum wave shear stress were used to estimate θ' as described earlier, the total bed roughness condition would likely be underpredicted.

In the model used in this analysis, if θ' is greater than θ_B (Shields parameter for ripple breakoff - equation 10), then both ripple roughness, k_{br}, and moveable bed roughness, k_{mb}, are estimated. If θ' is greater than θ_c, but less than θ_B, then only k_{br} is calculated. For calculation of the hydraulic roughness length, z_o, the total bed roughness is used such that $z_o = k_T/30$. The total boundary roughness is assumed to be composed of 4 potential components: one due to skin friction at the bed, k_b, based only on grain diameter; one due to form drag over the ripples, k_{br}; one due to the near-bed layer of sediment transport (k_{mb}); and one due to biogenic elements at the bed (k_{bi} - biological roughness). If $k_{br}>k_{bi}$, then k_{br} is to estimate the total boundary roughness, i.e., $k_T = k_b + k_{br} + k_{mb}$. If $k_{br}<k_{bi}$, then k_{bi} is used: $k_T = k_b + k_{bi} + k_{mb}$.

Equation for the calculation of resuspension

In the model used in this analysis, an experimentally derived equation was used to estimate the resuspension of bottom sediments (Vincent et al., 1981). Their equation was based on data from flume experiments of Kalkanis (1964) and Abou-Seida (1965) in which the effects of surface waves on a bed were simulated by moving an experimental sand bed. In these experiments, mechanically driven oscillating sand beds were placed on the bottom of a flume tank. The sand beds contained recessed trays which allowed for accumulation of the material lifted into suspension by the motion of the bed (Vincent et al., 1981).

Initially, the sand bed on the bottom of the flume is stationary and no sediment is in motion. As the sand bed increases in speed, the critical bed shear stress, τ_c, is exceeded and some sediment is lifted into suspension (Vincent et al., 1981). With increasing bed motion, the bed shear stress increases further and sediment continues to be moved from the bed. Throughout the period that the bed shear stress exceeds the critical, the number of sand grains in suspension remains a function of this excess bed shear stress ($\tau_{ex} = \tau - \tau_c$), (Vincent et al., 1981). While $\tau > \tau_c$, any sand which has been lifted from the bed and then moved over the recessed tray will be trapped by the tray, provided the time it takes for the sand to fall back to the bed is much less than a complete bed oscillation period. Thus, the mass of sand deposited in the trays per complete bed oscillation is interpreted by Vincent et al. (1981) to be a measure of the concentration of sand in suspension per wave period. The authors assume this interpretation to be reasonable if the height of the suspension of the sand is much less than 1 cm (the fall velocity for the smallest particles considered in the experiments of Kalkanis (1964) and Abou-Seida (1965) was about 1.5 cm/sec).

Vincent et al. (1981) plotted the data from Kalkanis (1964) and Abou-

Seida (1965) as the average areal concentration (C^* - the volume of sediment mobilized per unit area of bed, with units of cm^3/cm^2) against the maximum excess Shields Number ($\theta_{cx} = \theta - \theta_c$) occurring during a cycle. They found that for data with Reynolds Numbers in the transitional to turbulent flow range, there is a clear linear relationship between the average areal concentration C^* and the maximum excess Shields θ_{cx}. The proposed linear relationship between C^* and θ given by Vincent et al., is:

$$C^* = (0.09 \pm 0.03)(\theta - \theta_c) \qquad \textbf{(18)}$$

Though this equation was derived using data which are far from ideal, (relying on the simulation of the effects of surface waves on the bed by moving the bed, and on the recessed trays to effectively collect sand but not disturb the flow), Vincent et al. (1981) found predictions using their equation to be in very close agreement with observational data. Thus, equation 18 is used in this study to estimate the resuspension of bed sediments. The Modified Shields criterion (Madsen and Grant, 1976) is used to calculate θ_c, and θ is determined using the combined wave-current shear velocity as calculated in Grant and Madsen's (1986) model.

MATERIALS AND METHODS

Site

Chesapeake Bay may be characterized as a partially-mixed estuary which experiences a mean tide range of less than 1 m (Wright et al., 1987). In lower Chesapeake Bay, a wide range of energy conditions, as well as spacial variability in bottom roughness and benthic fauna are typical (Wright et al., 1987). Sediments of the lower bay floor are mainly sandy - relatively clean sands are found in the more energetic areas of the lower bay region, while finer grain size fractions characterize the less energetic environments (Wright et al., 1987). This study sought to model sediment resuspension of the particular lower Bay seabed environment described by Wright et al. (1987) as an estuary mouth shoal. Thimble Shoals was chosen because it represents this seabed environment. Specifically, the Buckroe sand reserve portion of Thimble Shoals (Figure 2) was chosen because recent research activities at this site have produced an extensive database that can be applied to the problem of resuspension.

Thimble Shoals is located just west of the bay mouth, and is typically dominated by hydrodynamically induced roughness elements (ie: ripples) rather than biogenic elements (Figures 3 and 4). It is a polyhaline (>20 ppt) environment and is of a depth varying between 4 m and 5.5 m (Kimball et al., 1989). In a report to the Coastal Erosion Abatement Commission, Hobbs et al. (1982) described Thimble Shoals as containing a very large volume (approximately 1.2×10^8 m^3) of potential beach quality sands. Further investigation of this area by Kimball et al. (1989) delineated three specific portions of Thimble Shoals as sand reserves suitable for use as beach nourishment material (Figure 2). Of

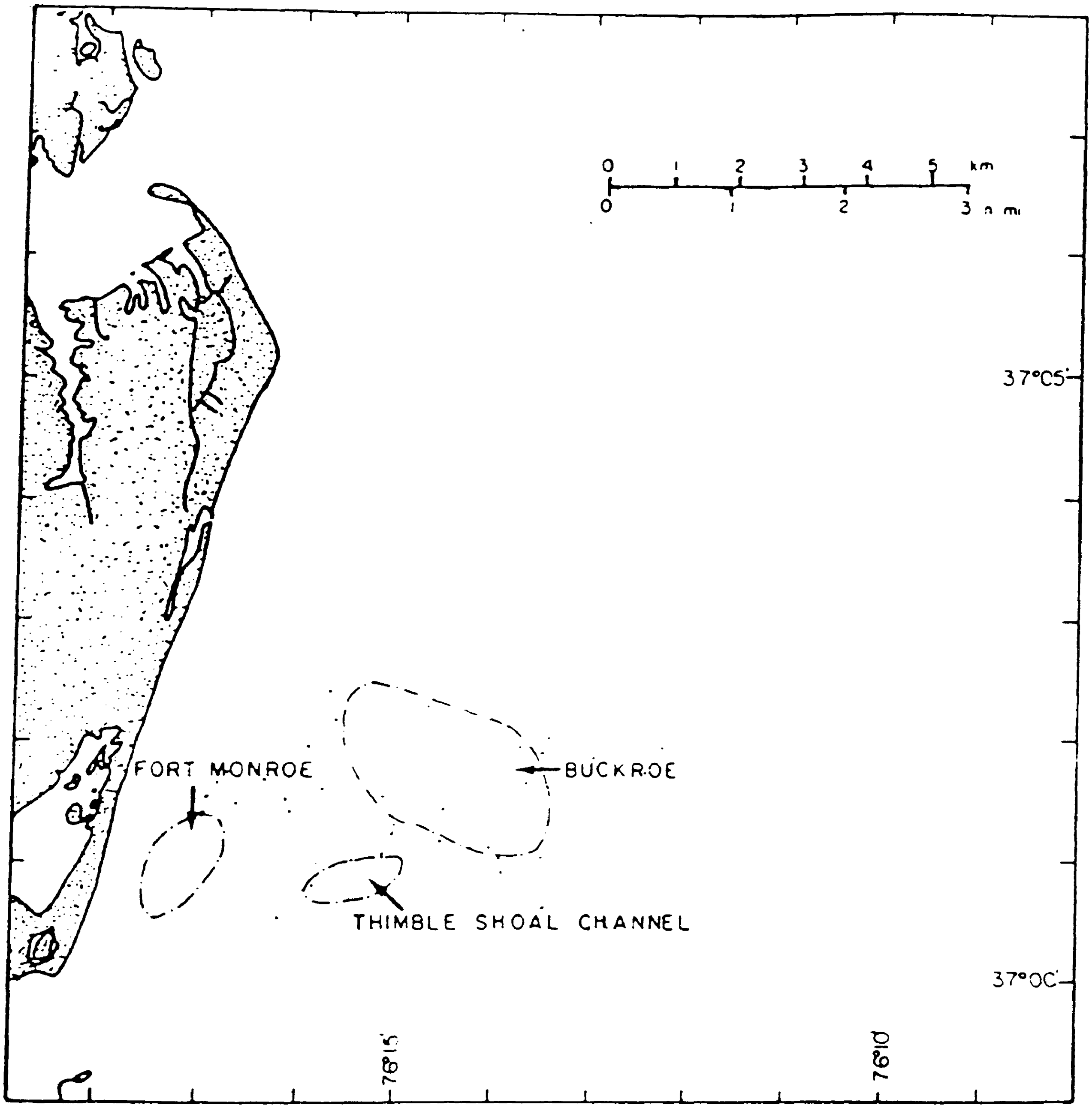


Figure 2. Location of the three sand reserve portions of Thimble Shoals as delineated by Kimball et al., (1989). The Buckroe reserve was the site of this study.

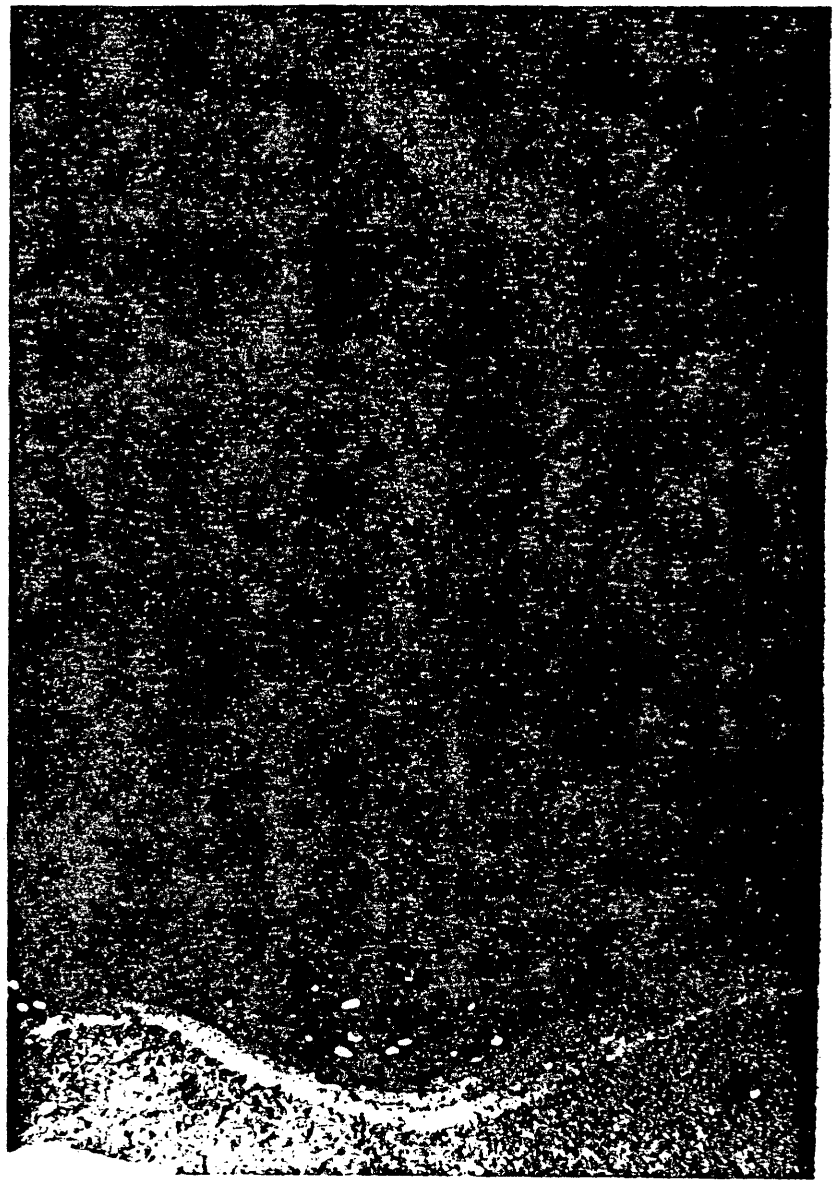


Figure 3. Profile photo of the Thimble Shoals bed (taken using the VIMS Surface and Profile Imaging System on 12 May 1988). Note the dominance of hydrodynamically induced roughness elements.

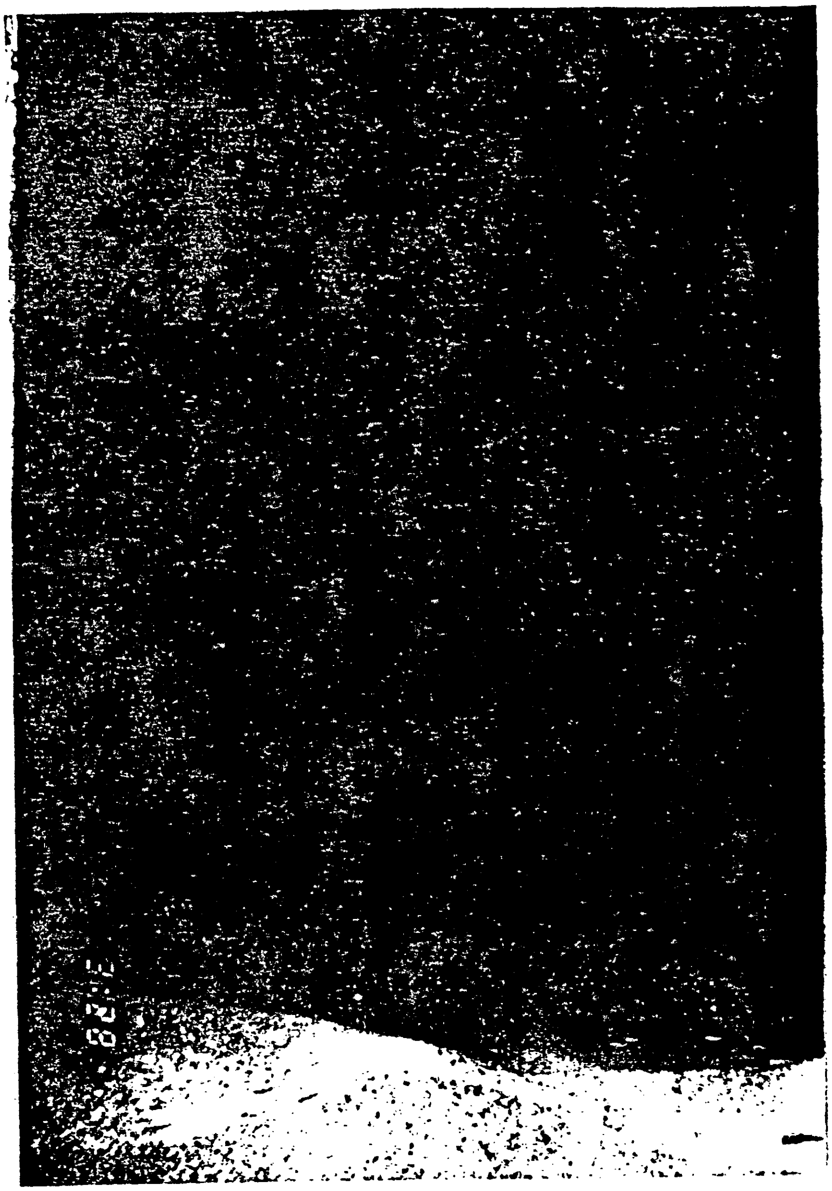


Figure 4. Profile photo of the Thimble Shoals bed (taken using the VIMS Surface and Profile Imaging System on 3 November 1988). Not the dominance of hydrodynamically induced roughness elements.

the three reserves described by Kimball et al. (1989) the Fort Monroe reserve was concluded to be the most desirable, in terms of location and nature of sand, for use as replenishment of eroding beaches of lower Chesapeake Bay communities (Kimball et al., 1989). The Buckroe reserve; however, was found to contain the largest volume of usable material (approximately 4×10^7 m^3), as well as the lowest apparent benthic resource value and was thus the choice for mining in late 1989.

The Buckroe reserve is located less than 2.5 km offshore and covers an area greater than 8×10^6 m^2. A medium to coarse grained sand deposit (mean grain size 0.5 mm; less than 1% silts and clays) lies more than 1 m below the seabed. Covering this deposit is an overburden of fine sand whose thickness ranges from 0.1 m at the western edge of the reserve to 1.5 m at the eastern edge. The mean grain size of the overburden is 0.17 mm (2.5 phi) (Kimball et al., 1989).

Benthic faunal density and biomass values of the Buckroe reserve were investigated and reported by Kimball et al. (1989) based on vertically partitioned core samples. Cores were 10 cm in diameter and taken to a depth of 15 cm. Sample size was 15 cores. Faunal density was 10.6 ± 2.6 indiv./core and biomass was 0.12 ± 0.07 grams/core. These values were the lowest of those for the 3 reserve sites. Based on underwater camera images, sedentary and motile epifauna (organisms which live at the sediment surface) were not observed at the Buckroe reserve (Kimball et al., 1989).

Data

Three types of data were needed as input for the numerical model used in this analysis including wave and current measurements, grain size distributions, and measurements of heights of biological roughness elements. The uses of these data in the model are discussed in the methodology section which follows. Wave and current data were measured using the Virginia Institute of Marine Science (VIMS) BBL instrumented tetrapod. These data were obtained by Boon et al. (1990) and are contained within their report. Grain size distributions used were those reported by Kimball et al. (1989). Biological roughness heights were measured on profile images taken by Kimball et al. (1989) at the Buckroe reserve using the VIMS Surface and Profile Imaging (SPI) system. Each of these data are now briefly discussed.

Wave and current data

For the period September 27, 1988, to October 17, 1989, VIMS had deployed an aluminum tetrapod containing wave and current sensing and recording instrumentation (Figure 5) at the easternmost edge of Thimble Shoals (latitude 37° 2.4′ N and longitude 76° 12.5′ W - Figure 6), (Boon et at., 1990). The tetrapod was retrieved and re-deployed at monthly intervals to allow for cleaning and recovery of data. Instrumentation contained on the tetrapod included a Sea Data Model 635-9RS directional wave gauge with a Paroscientific high-precision pressure transducer, a Digicourse internal compass, and a Marsh-McBirney remote 2-axis electromagnetic flow sensor with a 4-cm diameter sphere. The flow sensor was 20 cm below the pressure sensor and 1.5 m above the bottom.

Data loggers on the tetrapod were programmed for burst-mode sampling once every three hours (8 bursts per day) at a rate of 2 Hz for a duration of approximately 8.5 min. per burst. Thus, each burst contained 1024 measurements which were recorded on magnetic tape and later edited and processed in the lab in order to extract summary parameters representing that burst. The standard wave summary parameters are defined in detail in Boon et al. (1990) and are briefly described in Table 2 contained in this study. Of the 20 parameters, 8 were used for this analysis including Julian day, time, depth, mean current speed, mean current direction,

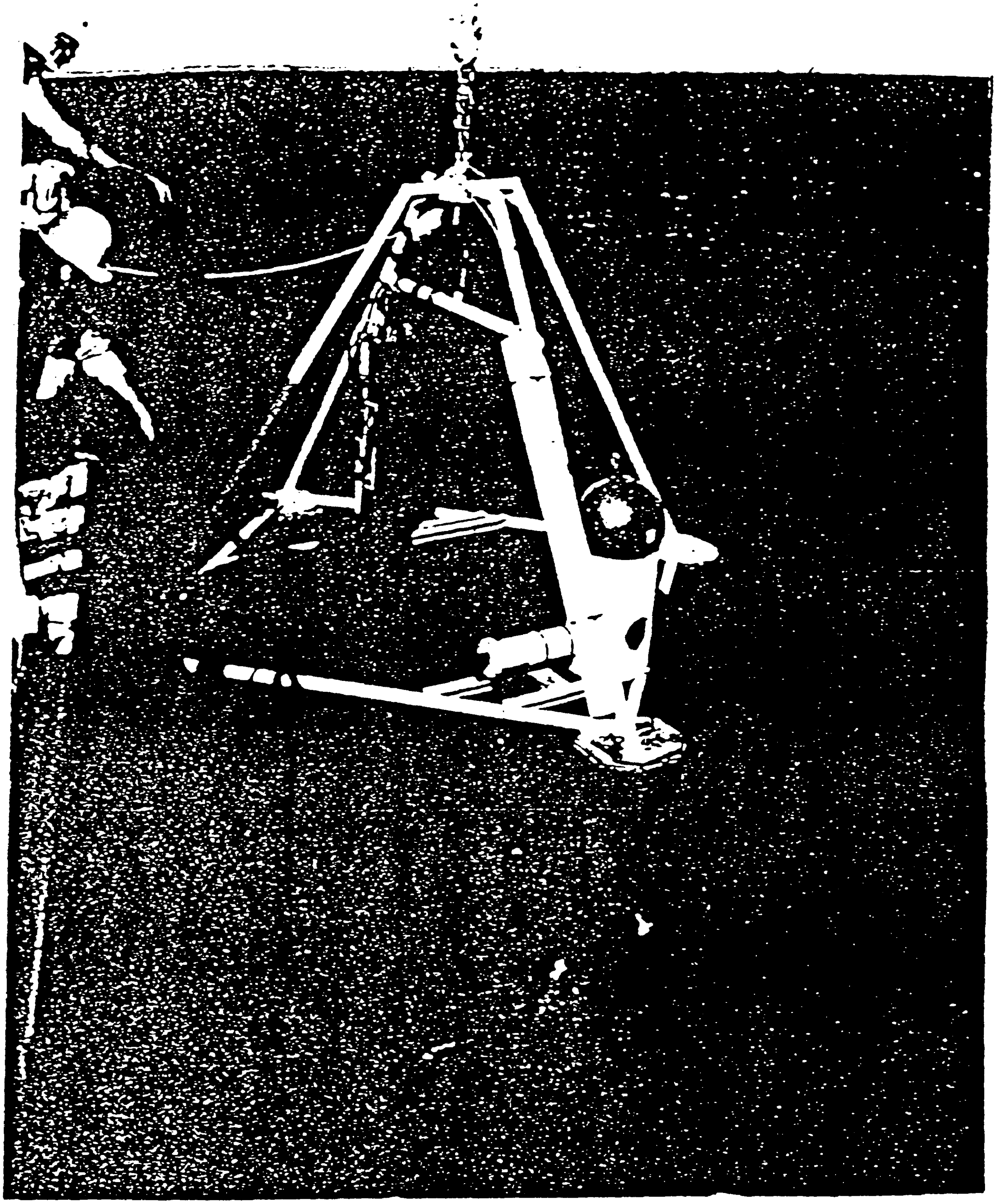


Figure 5. Photo of the Sea Data Model 635-9RS Directional Wave Gage mounted on the VIMS weighted aluminum tetrapod. From Boon et al., (1990).

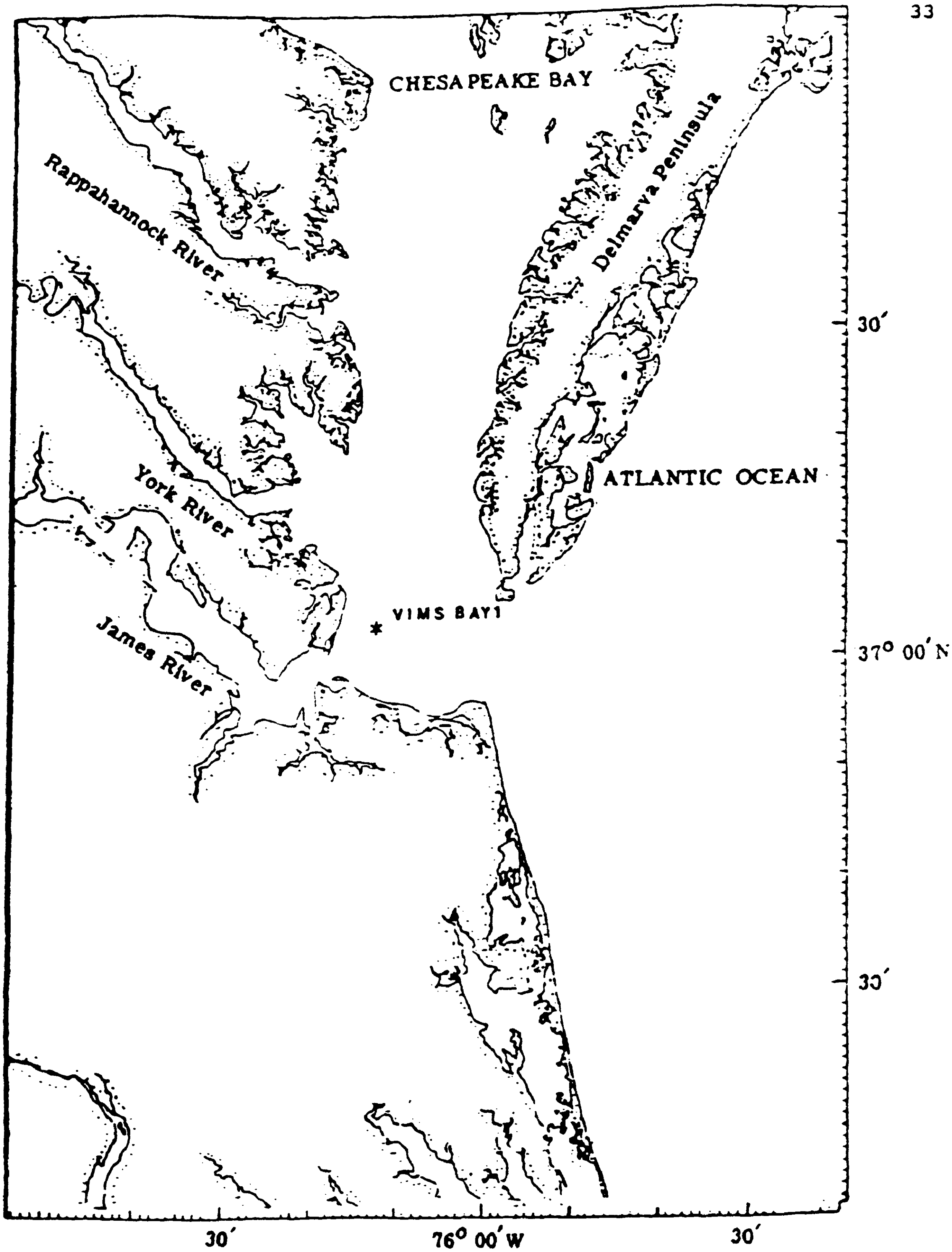


Figure 6. Location of the VIMS Wave Gage Station (VIMS BAY1) at the easternmost edge of Thimble Shoals in lower Chesapeake Bay, for the period September 27, 1988, to October 17, 1989. From Boon et al., (1990).

Table 2. Wave Parameters and their Description

Field	Parameter	Description
1	Mon	month (1..12)
2	Day	day (1..31)
3	Yr	year (01..99)
4	Jday	Julian day of year (1..366)
5	Time	24-hour Eastern Standard Time
6	Depth	burst-mean water depth (meters)
7	MC_SPD	mean current speed (cm/s)
8	MC_DIR	mean current direction (0..360)
9	WavDIR	principal wave direction (0..360)
10	Rvar	reduction in variance (0..1)
11	Hmo	zero-moment wave height (meters)
12	Tz	zero-up-crossing wave period (sec)
13	Tp	peak spectral wave period (sec)
14	%E>12 s	percent wave energy > 12 sec
15	%E12-8 s	" " " between 12 and 8 sec
16	%E8-6 s	" " " between 8 and 6 sec
17	%E6-4 s	" " " between 6 and 4 sec
18	%E<4 s	" " " < 4 sec
19	code	data quality code (G,W,S,M)
20	source	source data DOS file name

From Boon et al., (1990)

principal wave direction, zero-moment wave height, and peak spectral wave period. The summary parameters were stored on floppy disks in ASCII text file format and were edited for use in this analysis using Quattro spreadsheet software (Borland International) and Procomm Plus editing software (Datastorm Technologies, Inc.).

Data collected from the Thimble Shoals wave gauge were used as a means of partially characterizing the lower Chesapeake Bay wave climate (Boon et al., 1990). The data indicate a bimodal distribution in wave energy conditions experienced in lower Chesapeake Bay. The two groups of wave energy correspond to waves generated within the bay with a southerly direction of wave advance, and waves generated external to the bay with a west to west-northwest direction of advance. The mean wave height during the measurement period was 0.4 m with an associated period of 6 seconds for both wave directions.

Grain size distributions

Grain size distributions used in this analysis were those reported by Kimball et al. (1989) for the Buckroe reserve of Thimble Shoals. Characteristic coarse, mean and fine grain sizes were needed. Sediments analyzed for the distributions were composites of surface grab samples (top 15 cm) obtained with a Smith Mac grab, and short core samples (top 0.5 m) obtained with a modified vibrecore system developed at VIMS . Twenty-four samples were collected on April 4, 1988, and six samples on April 21, 1988.

Analysis of samples included separation of sand, silt and clay fractions, and calculation of the size distribution of the sand fraction using the VIMS Rapid Sediment Analyzer. Table 3 contained in this study presents summary data for the thirty samples including mean grain size, standard deviation, location, depth, and date taken.

Table 3. Sediment data for the Buckroe reserve (HMP3(M))-HMP15(O)) and for the Thimble Shoal Channel reserve (HMP16(N)-HMP24) of Thimble Shoals.

sample #	mean grain size phi	mm	SD	location lat.	long	depth(ft)	date taken
HMP3(M)	2.6	0.16	0.27	37 1.3'	76 13.9'	?	4-11-88
HMP3A(M)	2.6	0.16	0.22	37 1.1'	76 13.7'	?	4-11-88
HMP3B(M)	2.6	0.16	0.24	37 1.3'	76 13.9'	16	4-11-88
HMP4(E)	2.6	0.16	0.21	37 1.4'	76 14.5'	16	4-11-88
HMP5(L)	2.5	0.17	0.32	37 1.6'	76 13.6'	17	4-11-88
HMP6(I)	2.5	0.17	0.34	37 2.0'	76 14.0'	16	4-11-88
HMP7(J)	2.5	0.17	0.38	37 2.0'	76 14.5'	15	4-11-88
HMP8(K)	2.5	0.17	0.35	37 2.1'	76 15.0'	14/15	4-11-88
HMP9(H)	2.6	0.16	0.32	37 1.9'	76 15.9'	16	4-11-88
HMP10(F)	2.6	0.16	0.35	37 2.4'	76 15.7'	16	4-11-88
HMP11(G)	2.9	0.13	0.30	37 3.1'	76 15.7'	17	4-11-88
HMP12(A)	2.7	0.15	0.29	37 2.9'	76 15.0'	14	4-11-88
HMP13(P)	2.5	0.17	0.36	37 2.8'	76 13.4'	16	4-11-88
HMP14(Q)	2.5	0.17	0.39	37 2.9'	76 13.3'	16	4-11-88
HMP15(O)	2.6	0.16	0.27	37 1.3'	76 15.5'	15	4-11-88
HMP16(N)	1.8	0.28	0.40	37 1.0'	76 15.6'	13	4-11-88
HMP17	1.7	0.29	0.48	37 0.9'	76 15.4'	21	4-11-88
HMP18	2.2	0.21	0.79	37 0.7'	76 15.5'	33	4-11-88
HMP19	1.9	0.26	1.00	37 0.7'	76 16.0'	29	4-11-88
HMP20	2.1	0.23	0.56	37 0.9'	76 15.9'	21	4-11-88
HMP21	1.6	0.33	0.43	37 1.0'	76 15.6'	14	4-11-88
HMP22	1.7	0.30	0.36	37 1.0'	76 15.6'	15	4-11-88
HMP23	1.7	0.30	0.43	37 0.9'	76 15.4'	19	4-11-88
HMP24	1.7	0.30	0.44	37 1.0'	76 15.5'	17	4-11-88
HMP1	2.6	0.16	0.34	37 2.0'	76 15.4'	14	4-21-88
HMP_2	2.6	0.16	0.30	37 2.0'	76 15.4'	13	4-21-88
HMP3	2.5	0.17	0.29	37 1.9'	76 15.5'	14	4-21-88
HMP4	2.6	0.16	0.34	37 2.1'	76 15.5'	14	4-21-88
HMP5	2.6	0.16	0.28	37 2.0'	76 15.3'	13	4-21-88
HMP6	2.6	0.16	0.30	37 2.0'	76 15.2'	14	4-21-88

It was initially thought that all thirty samples were indeed taken within the Buckroe reserve of Thimble Shoals - as this is what was reported by Kimball et al. (1989). A closer look at the location of each sample and plotting of sample locations (Figure 7) revealed that 9 of the samples (HMP16(N)-HMP24) were actually taken much closer to the Thimble Shoal Channel (TSC) reserve. Further investigation also showed that the grain size, standard deviation and depth of these 9 samples were very characteristic of those reported for other TSC samples (Kimball et at., 1989). Thus, for this analysis, modeling of resuspension of bottom sediments characteristic of the Buckroe reserve did not include those 9 samples. Predictions of sediment resuspension of the TSC reserve were made using the 9 samples characteristic of TSC sediments for a few months. This was done in order to compare predicted resuspension for the two different sediment populations under varying energy conditions.

Biological roughness data

Biological roughness heights were measured on slides obtained using a remotely deployed underwater camera system. This system is designed to provide information on the larger, more sparsely distributed organisms existing on or just above the sediment surface (Kimball et al., 1989). The Surface and Profile Imaging System (SPI) was developed at VIMS and provides a view of the sediment water interface. The system consists of a Benthos model 371 and 372 standard camera and flash which provides images of the sediment surface. The SPI system also contains a modified Benthos model 3731 sediment profile camera which actually penetrates the bed providing images of the sediment column 15 cm wide x 20 cm deep. Because heights of biological roughness elements were needed for this analysis, only the profile images were used.

On May 12, 1988, the SPI system was deployed at the Buckroe reserve obtaining 36 profile images (Kimball et al., 1989); on November 3, 1988,

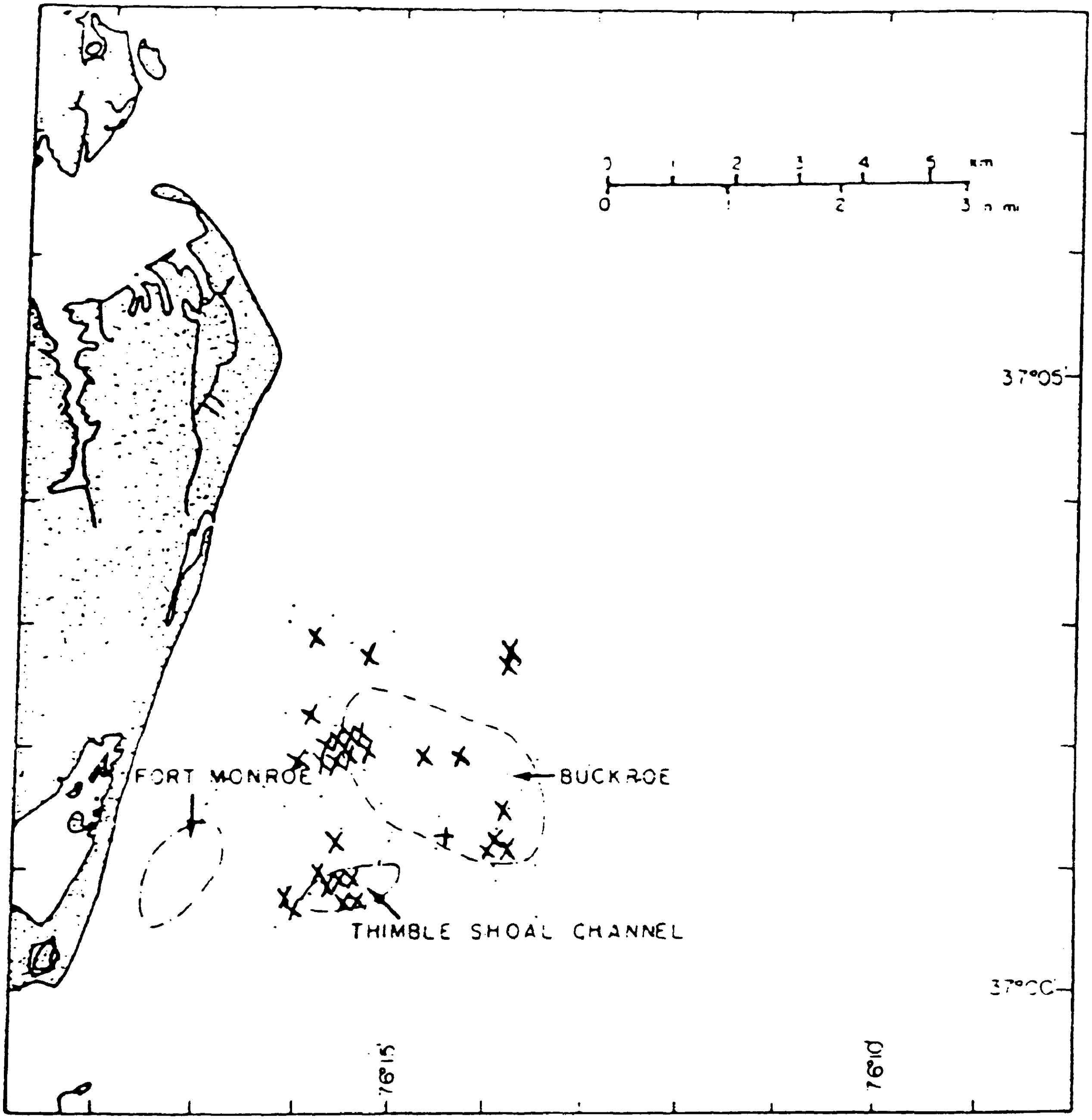


Figure 7. Location of the Buckroe reserve sediment samples reported by Kimball et al., (1989). Modified from Kimball et al., (1989).

6 more profile images were obtained. Table 4 contains biological roughness height summary data. In all 42 images, the bed was characterized by fine to medium sand and dominated by hydrodynamically induced bedforms (i.e., ripples), (Kimball et al., 1989; Linden, personal observation). Kimball et al. (1989) report observations of small tubes at the sediment-water interface in 17 of the profile images. I was only able to observe tubes in 14 of the images. Density information reported in Table 4 is based on my personal observations of the images. Roughness heights were measured directly from 35 mm slides and are mainly heights of tubes with the exception of BB22 which also includes a bivalve. Each image contained tick marks at 1 cm intervals, thus a conversion factor for heights measured on slides to real heights was easily calculated. Heights reported in Table 4 are an average of all real roughness heights measured on a particular slide. The mean biological roughness height of all slides was 0.50 cm.

As was mentioned previously, all of the 42 profile images from the Buckroe reserve showed flow induced ripples on the bed. Because the 6 slides from November were the only images to correspond to a date of actual wave and current data, these images were used to compare observed ripple roughness to that predicted by the model. Ripple height and wavelength were measurable on 4 of the 6 images.

<u>Methodology</u>

The model used in this study to estimate combined wave-current seabed shear stress for subsequent use in predicting sediment resuspension, was that developed by Grant and Madsen (1986). Their model is described in the background section of this study. The key units of the model were implemented and programmed for use on PC-based software by S.C. Kim (VIMS). Additional portions of the model not described in the background section of this study, but necessary for the calculation of some

Table 4. Biological roughness height summary data

Measured from profile images taken at the
Buckroe Beach site of Thimble Shoal
12 May 1988 and 3 November 1988

Tube density:
L(<=5 tubes/image)
M(6-25 tubes/image)

Station	Sed. type	interface	heights (cm)	density	comments
BB-01	med/fine sand	bedforms	0.25	L	
BB-02	med/fine sand	bedforms	*nb		
BB-03	med/fine sand	bedforms	nb		
BB-04	med/fine sand	bedforms	nb		
BB-05	med/fine sand	bedforms	0.50	L	Diopatra tube
BB-06	med/fine sand	bedforms	0.25	L	
BB-07	med/fine sand	bedforms	nb		
BB-08	med/fine sand	bedforms	nb		
BB-09	med/fine sand	bedforms	nb		
BB-10	med/fine sand	bedforms	nb		
BB-11	med/fine sand	bedforms	1.06	L	solitary hydroid
BB-12	med/fine sand	bedforms	0.63	L	Diopatra tube
BB-13	med/fine sand	bedforms	nb		
BB-14	med/fine sand	bedforms	nb		
BB-15	med/fine sand	bedforms	0.42	L	
BB-16	med/fine sand	bedforms	0.40	L	
BB-17	med/fine sand	bedforms	0.45	M	
BB-18	med/fine sand	bedforms	nb		
BB-19	med/fine sand	bedforms	nb		
BB-20	med/fine sand	bedforms	nb		
BB-21	med/fine sand	bedforms	nb		
BB-22	med/fine sand	bedforms	0.13	L	bivalve
BB-23	med/fine sand	bedforms	nb	L	
BB-24	med/fine sand	bedforms	nb		
BB-25	med/fine sand	bedforms	0.63	L	
BB-26	med/fine sand	bedforms	nb		
BB-27	med/fine sand	bedforms	nb		
BB-28	med/fine sand	bedforms	0.54	L	
BB-29	med/fine sand	bedforms	missing slide		
BB-30	med/fine sand	bedforms	0.38	L	
BB-31	med/fine sand	bedforms	nb		
BB-32	med/fine sand	bedforms	nb		
BB-33	med/fine sand	bedforms	nb		
BB-34	med/fine sand	bedforms	nb		
BB-35	med/fine sand	bedforms	nb		
BB-36	med/fine sand	bedforms	0.25	L	
BB-A	med/fine sand	bedforms	nb		
BB-B	med/fine sand	bedforms	0.63		
BB-C	med/fine sand	bedforms	nb		
BB-D	med/fine sand	bedforms	nb		
BB-E	med/fine sand	bedforms	nb		
BB-F	med/fine sand	bedforms	nb		

*nb indicates that biogenic roughness elements were either not visible or not measurable on slide.

mean biological
roughness ht. = 0.50cm

parameters within the model include the calculation of the critical Shields Parameter and various wave parameter calculations (ω, A_b, U_b, and kh). These parameters and their calculations are now briefly described.

In this analysis, a modified Shields criterion was used to estimate the critical Shields parameter (Madsen and Grant, 1976). It is based on a sediment parameter, S_*, which is a function of the sediment and fluid properties only, and is calculated using equation 12 given in the Background chapter of this study. S_* is a dimensionless parameter which defines a critical combination of the two parameters, θ and R_*, (Shields and grain Reynolds number), commonly used in the Shields diagram for the initiation of sediment movement (Madsen and Grant, 1976).

Some of the wave parameter calculations used in the model are based on Nielson's (1982) explicit formulae for commonly used wave parameters in intermediate water depths. One such parameter is kh, for which Nielson (1982) derives an equation using a Taylor expansion:

$$kh = (\sqrt{k_o d})\,(1 + \frac{1}{6}(k_o d) + \frac{11}{360}(k_o d)^2) \tag{19}$$

In this equation, d is water depth, and k_o is the deep water wave number ($k_o = 2\pi/L_o$), where L_o is the deep water wave length ($L_o = gT^2/2\pi$) and T is wave period. Other wave calculations used in the model include the radian wave frequency, ω, where $\omega = 2\pi/T$, wave excursion amplitude, A_b, where:

$$A_b = \frac{H}{2\sinh(kh)} \tag{20}$$

and the equivalent orbital velocity amplitude, U_b, where:

$$U_b = A_b \omega \tag{21}$$

In equation 20, H is the wave height. The wave period and wave height used in these calculations were part of the input data set described earlier. The wave height used in this study is called a zero-moment wave height (Hmo) as it is derived from a converted pressure signal. Briefly, the pressure readings from the BBL pressure sensor are reduced to zero-mean value, and subsequently converted to a depth-frequency corrected sea level (CSL) series using the method of Nielson (1986, 1989) and linear wave theory (Boon et al., 1990). The zero-moment wave height is then determined from the fluctuating (zero-mean) CSL series. It is defined as four times the standard deviation of the series and is considered equivalent to the significant wave height (Boon et al., 1990). The wave period used in this analysis is called the peak spectral wave period (T_p). It is determined using spectral methods, and is associated with the peak spectral energy density in each CSL series. Often, the spectra showing energy density as a function of frequency contained multiple peaks. In such cases, the highest peak was used to determine T_p as the reciprocal of the peak frequency (Boon et al., 1990).

Grant and Madsen's (1986) model to estimate bed shear stress in combined wave and current environments was developed based on the assumption of a wave-dominated environment. Though this is not a limiting assumption, it is important to realize in analyzing model predictions. A wave-dominated environment as defined by Grant and Madsen (1982) is one in which the near-bottom wave orbital velocity is greater than the magnitude of the mean current in the vicinity of the wave boundary layer. Thus, in such environments, the wave orbital velocity is most often responsible for moving bed sediments. In this study, all predicted resuspension events were assumed to be due to the wave orbital motion. It is important to note; however, that even in wave-dominated environments the mean current may sometimes cause sediment movement. In order to demonstrate the relative contributions of the wave and current forcings at Thimble Shoals to the combined bed shear velocity as estimated from Grant and Madsen's model, a description of the hydrodynamic regime is provided within this study. Plots of the mean current velocity relative to the equivalent orbital velocity amplitude (based on Hmo) are presented and are compared to the combined skin friction shear velocity (that portion of the total bed shear which is directly responsible for sediment motion). These comparisons allow determination of which velocity component (U_b or U_c) contributing to the combined skin friction shear, $U_{*cw(f)}$, may be more responsible for moving bed sediments. Also, in order to more directly address the role of currents in resuspending bed sediments at Thimble Shoals, plots of the model predicted current shear velocity, U_{*c}, and wave shear velocity, U_{*wm}, are included. All of these plots and a brief discussion may be found in the following chapter of this study.

As mentioned earlier, in order to estimate bed shear stress in shallow coastal environments, accurate specification of the physical bed roughness is first required. The total bed roughness includes four separate portions which must be determined (skin friction, ripple, biogenic, and moveable bed). The skin friction roughness, since it is a function of sediment grain size, is calculated using the mean sediment grain diameter as estimated from the Buckroe reserve grain size distributions. These distributions were described in the data section of this study. Form drag roughness (both ripple and biological) is best estimated from actual field measurements. For this study, biological roughness heights were measured off images of the bed taken from within the Buckroe reserve (described in the data section of this study). Sufficient observations of ripple roughness were not available for this study. Thus, ripple dimensions and ripple roughness, as well as moveable bed roughness, were predicted using the roughness model developed by Grant and Madsen (1982) which is described in the background section of this study.

After predictions of total bed roughness and estimations of the combined bed shear stress are complete, sediment resuspension may be predicted. For the prediction of sediment resuspension done in this study, the equation derived by Vincent et al. (1981) (equation 18, described in the background section of this study) was used. It is important to emphasize that the term resuspension implies only local entrainment; this is what was predicted in this study. Ordinary sediment in suspension which may exist at the site as a result of advective effects was not considered. Also, because resuspension is sensitive to grain size, predictions of sediment resuspension were done for the mean, coarse, and fine grain sizes as estimated from Buckroe reserve grain size distributions. Differences in the frequencies and magnitudes of resuspension predicted for each grain size were compared.

It is important to note that in analyzing the resuspension predicted using Vincent et al.'s (1981) equation, attention focused primarily on relativity rather than on the actual predicted resuspension values. That is, the relative differences in predicted resuspension with changing energy conditions, and for each wave energy component were emphasized. Though it is reasonable to assume the resuspension to be proportional to the excess Shields parameter, the constant derived by Vincent et al. (1981) in equation 18 may or may not be completely valid as applied to this study. A detailed discussion of the validity of their constant is beyond the scope of this study. It should be noted; however, that if the constant used in equation 18 were changed, this would not change the conclusions reached in this study.

Because one of the main objectives of this study was to isolate the portions of the local resuspension associated with the two main wave energy components affecting the Thimble Shoals site, criteria were needed in order to assign one or the other component to each resuspension event.

Criteria used were based on Boon et al. (1990) Thimble Shoals wave characteristics description. All waves with peak spectral wave period, T_p, greater than 8.0 seconds were assigned to the "sea wave" condition. The peak spectral wave period was used as it is associated with the peak spectral energy density (Boon et al., 1990). Thus, it was assumed that the peak energy component was the one moving sediments at the bed. A window of wave headings was chosen based on Figure 6 (between 258° and 302°) within which all waves with $T_p>6$ s and $T_p<=8$ s were also assigned the "sea wave" condition. All waves with $T_p<=6$ s, or $T_p>6$ s and $T_p<=8$ s and outside of the 258°-302° wave heading window were assigned the "bay wave" condition. These criteria are summarized in Table 5.

All of the raw output data from the boundary layer model may be found in the Appendix.

Table 5. Summary of "sea wave"/"bay wave" criteria

If:	Then source is:
T > 8.0 s	sea wave
T > 6.0 s and T <= 8.0 s, and alpha > 258° and alpha < 302°	sea wave
T > 6.0 s and T <= 8.0 s and alpha <= 258° and alpha >= 302°	bay wave
T <= 6.0 s	bay wave

(T represents the peak spectral wave period and alpha is the wave direction)

HYDRODYNAMIC REGIME

Figures 8-20 (a) depict graphically the hydrodynamic regime at Thimble Shoals for the months October, 1988, through October, 1989. Equivalent orbital velocity amplitude (U_b - based on Hmo) and mean current velocity, U_c, are represented in a time series. Throughout this chapter and in the results section of this study, data for October, 1989, are shown, however, these results are not discussed relative to the other months as only a half month of data were collected. Mean current velocity was part of the input data set (one of the summary parameters measured and reported by Boon et al., 1990). Equivalent orbital velocity amplitude was calculated using equations 20 and 21 as described in the methodology section of this study. Julian day is represented on the x-axis; however, each tick mark on the x-axis represents a single burst (8 bursts per day, approximately 240 bursts per month).

Throughout all months, with the exception of AUG89 and SEP89, U_b overall remained less than U_c. In AUG89 and SEP89, U_b was generally equal to or slightly greater than U_c. For all months, the majority of U_b measurements fell between 0 cm/s - 20 cm/s. Values of the mean current velocity generally fell within 5 cm/s - 50 cm/s, and often were greater than 20 cm/s. This is important since a mean current velocity of greater than 20 cm/s is typically thought to be capable of causing sediment motion. With the exception of MAY89, JUN89, and JUL89, single sharp peaks and groups of peaks in U_b values which exceed U_c values may be noted for all other months. In MAY89, JUN89, and JUL89, peaks in U_b values do occur; however, these remained small (20 cm/s - 40 cm/s) and generally less than U_c values. For 7 of the months of measurements (OCT88, NOV88, DEC88,

Figures 8-20 (a-c). Thimble Shoals hydrodynamic regime and model predicted friction for the months of October, 1988, through October, 1989. A - Bottom orbital velocity vs. mean current velocity. B - Skin friction shear velocity. C - Wave shear velocity and current shear velocity.

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

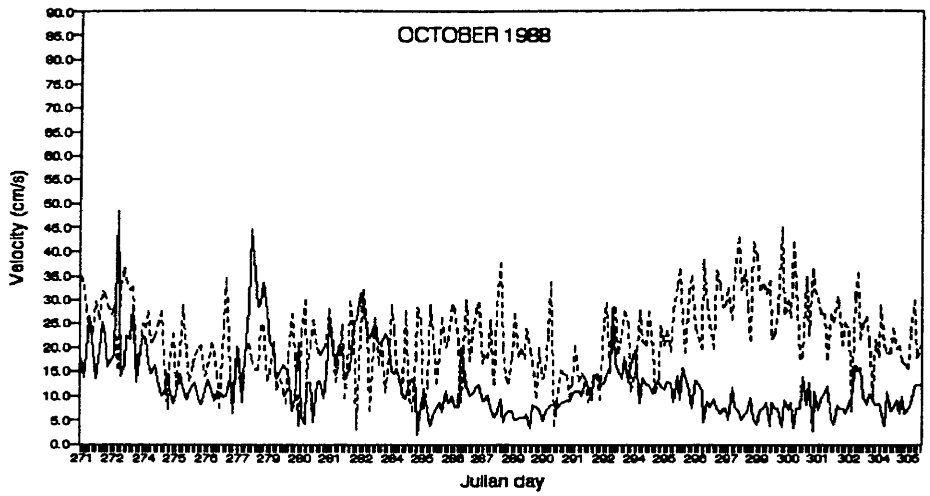


Figure 8a

Skin friction shear velocity

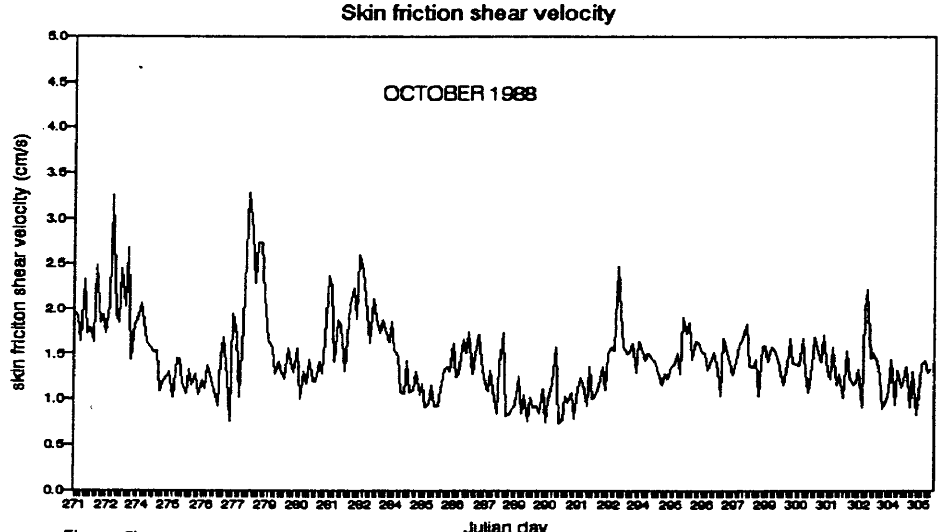


Figure 8b

Wave shear velocity and Current shear velocity

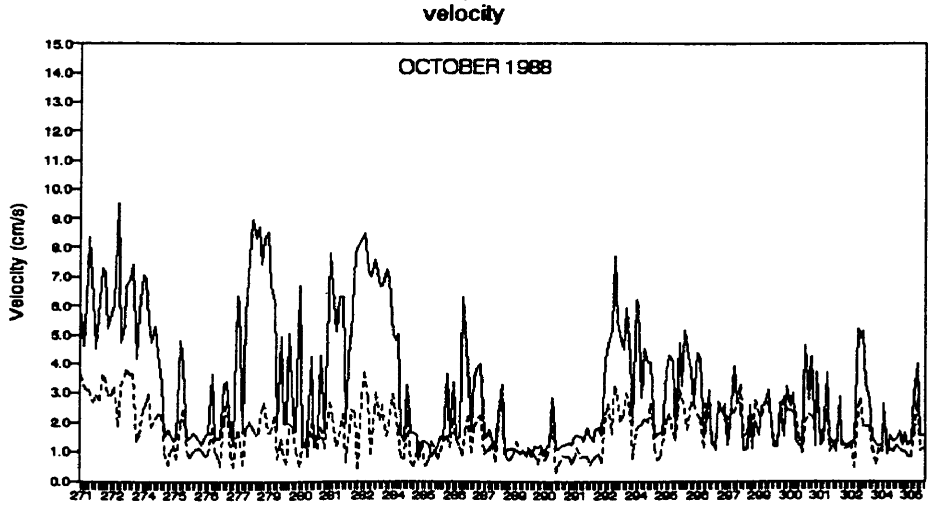


Figure 8c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

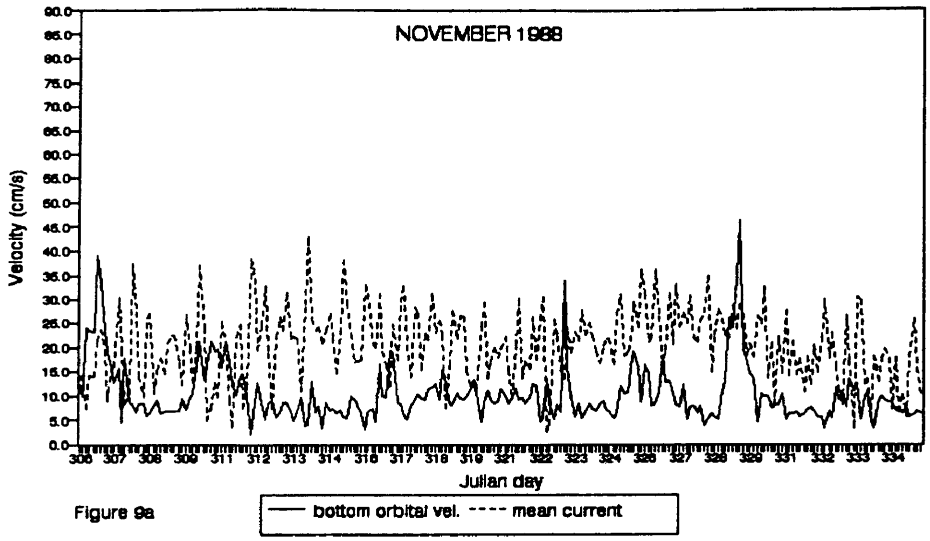


Figure 9a

Skin friction shear velocity

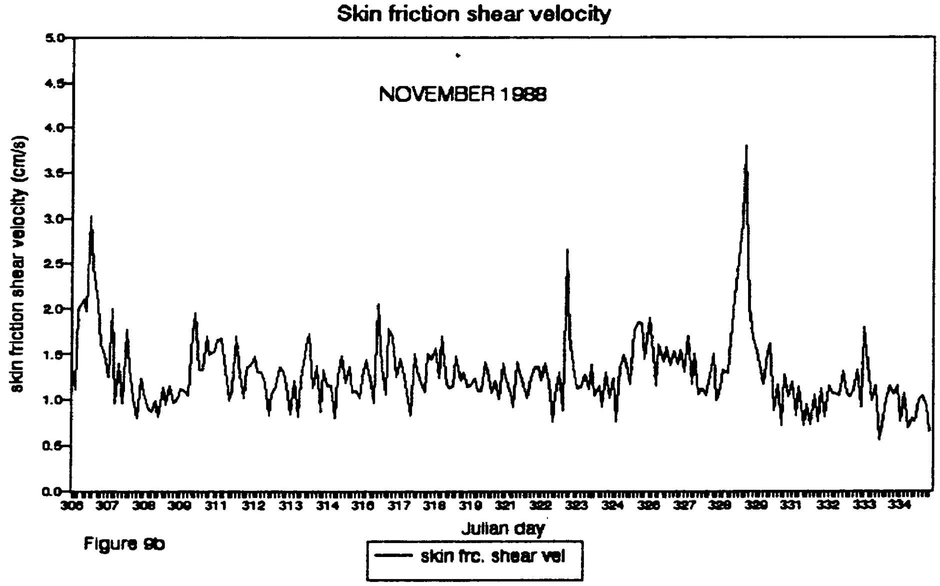


Figure 9b

Wave shear velocity and Current shear velocity

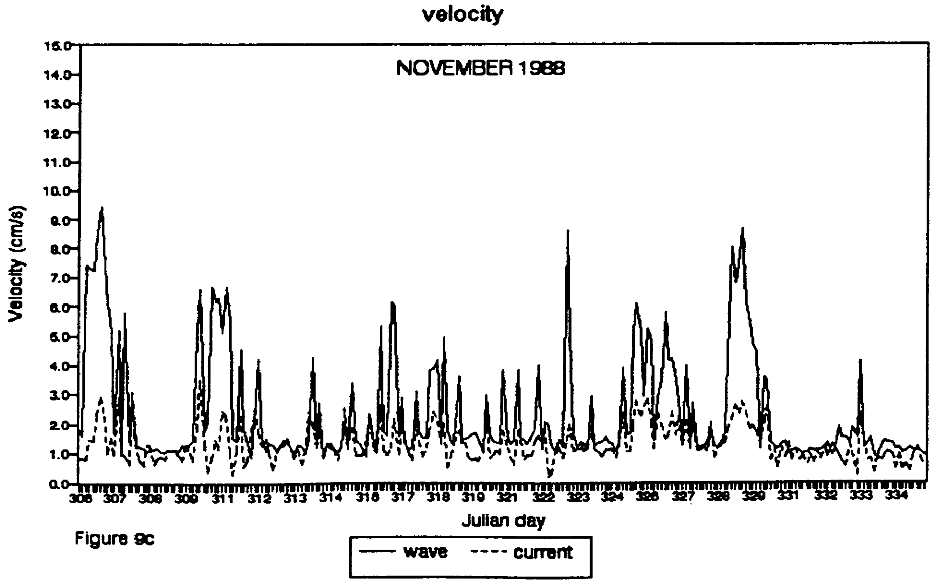


Figure 9c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

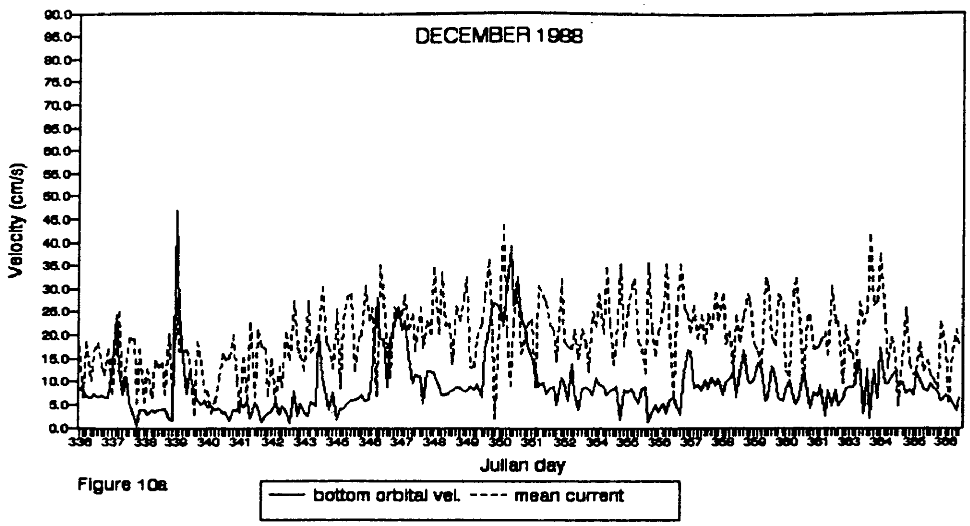


Figure 10a

Skin friction shear velocity

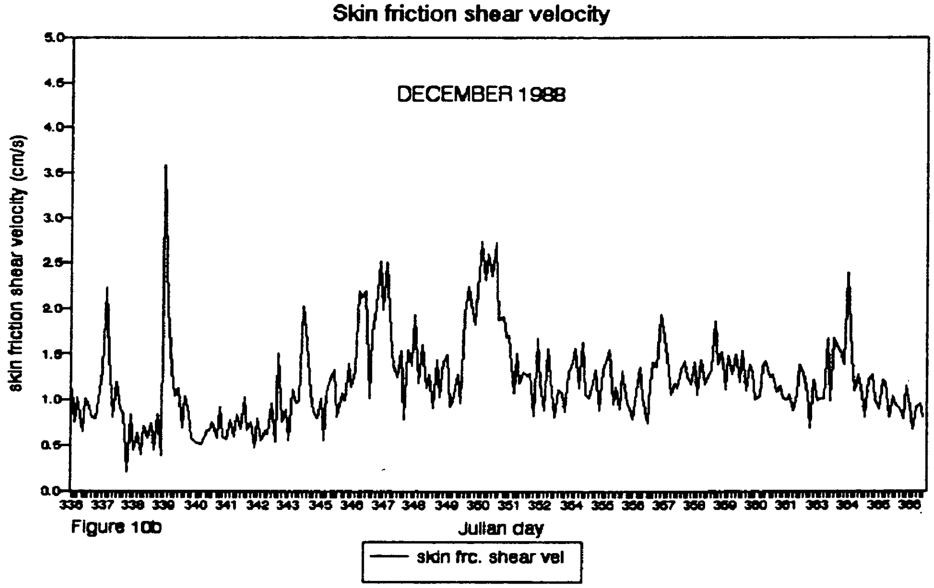


Figure 10b

Wave shear velocity and Current shear velocity

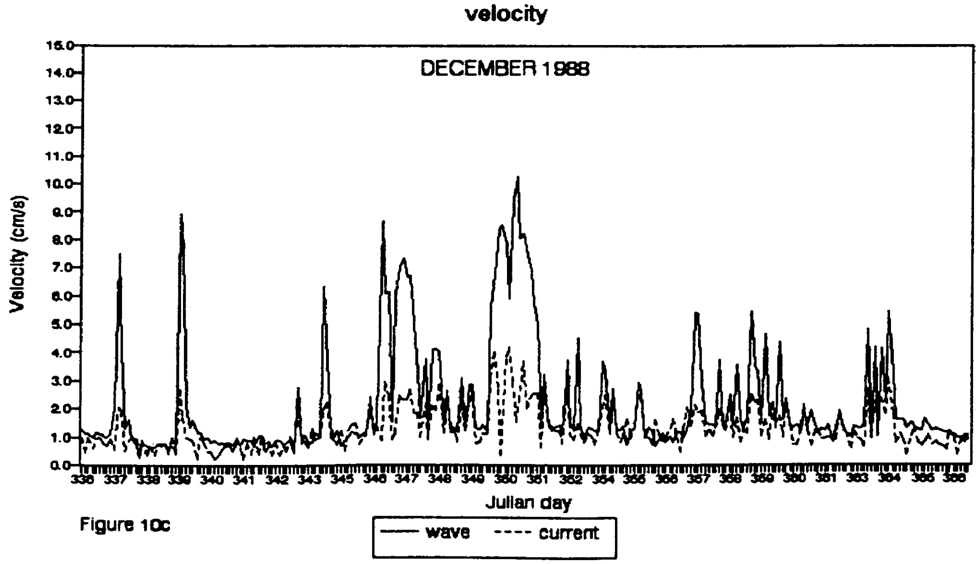


Figure 10c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

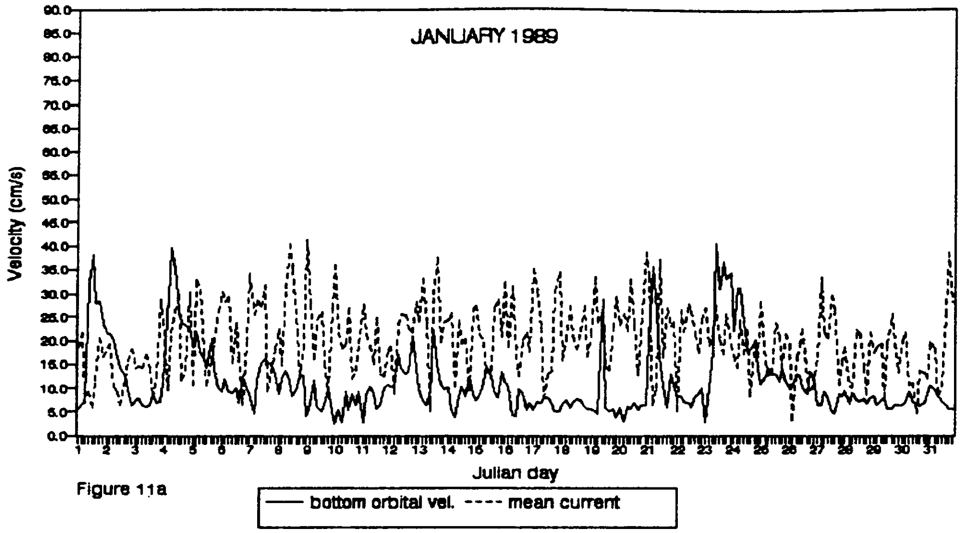


Figure 11a

Skin friction shear velocity

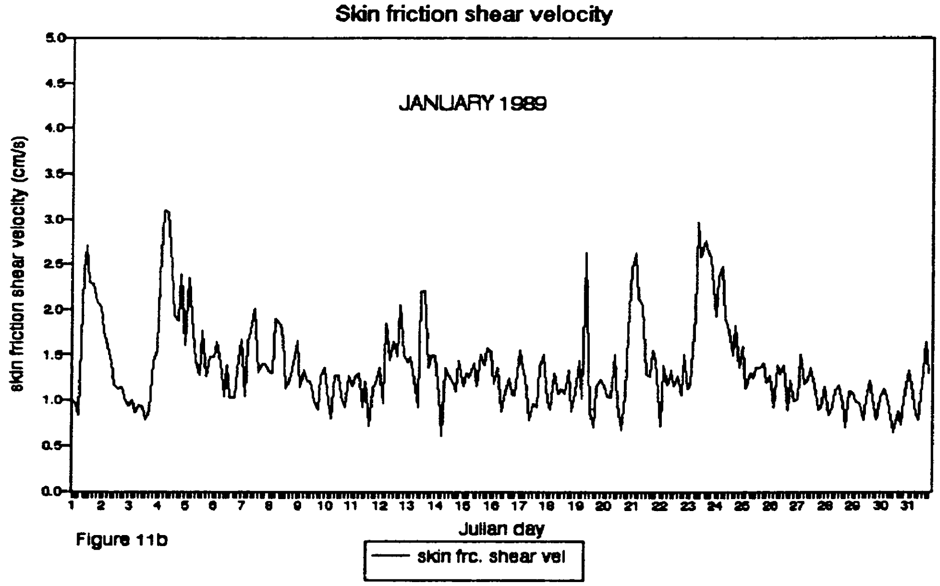


Figure 11b

Wave shear velocity and Current shear velocity

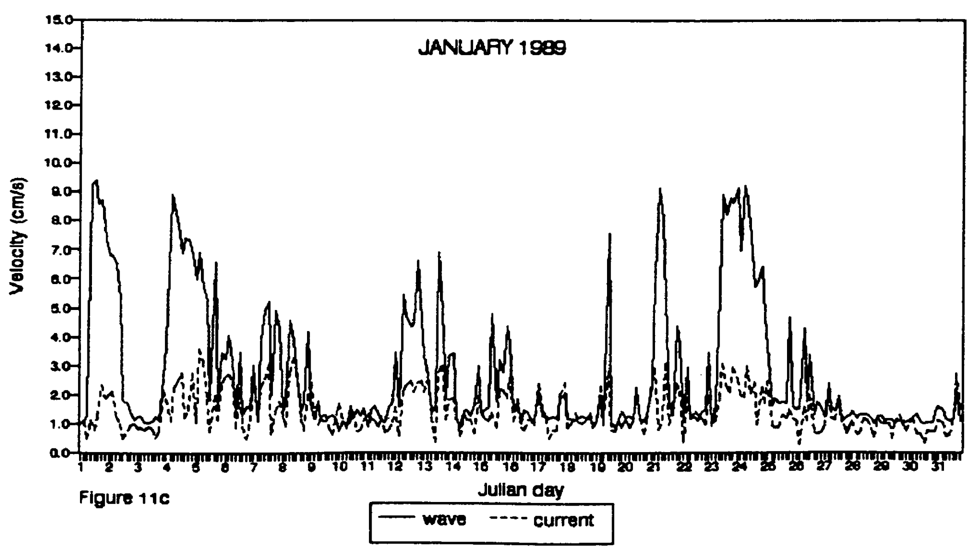


Figure 11c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

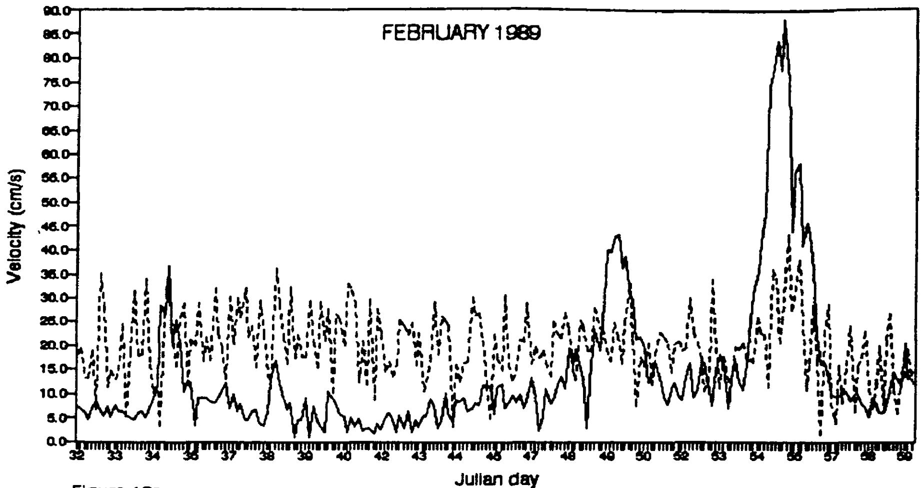


Figure 12a

— bottom orbital vel. ---- mean current

Skin friction shear velocity

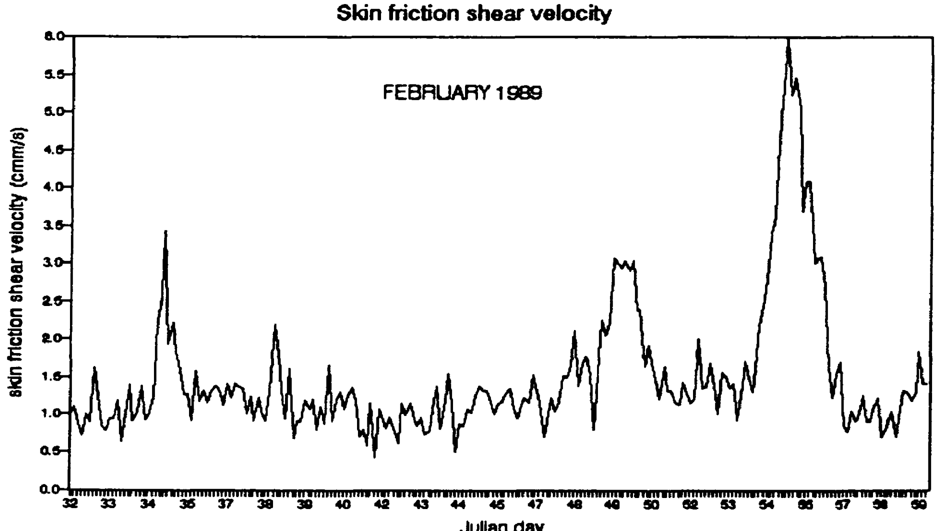


Figure 12b

— skin frc. shear vel

Wave shear velocity and Current shear velocity

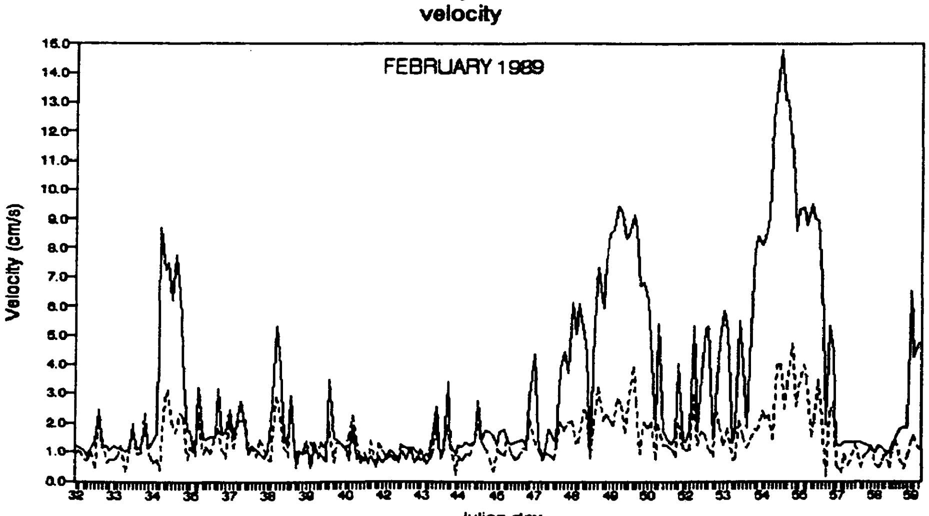


Figure 12c

— wave ---- current

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

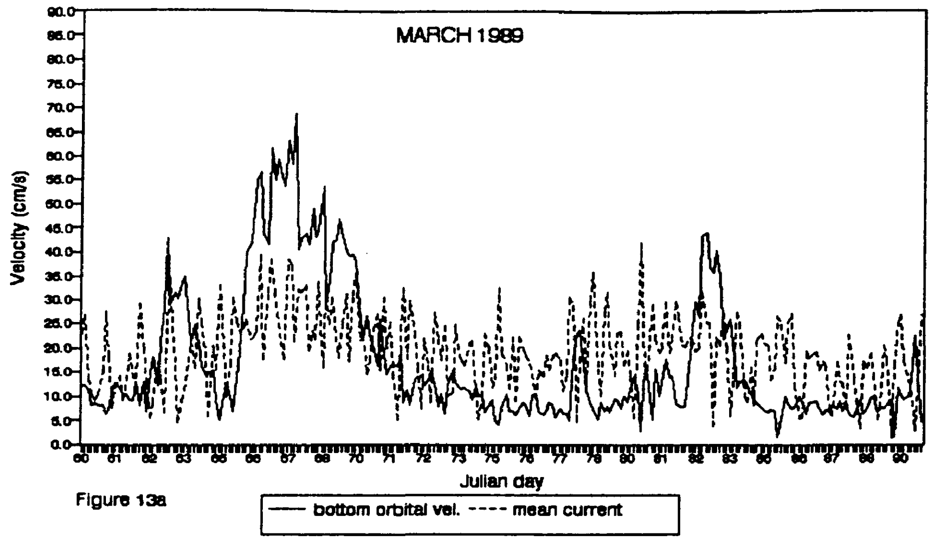


Figure 13a

Skin friction shear velocity

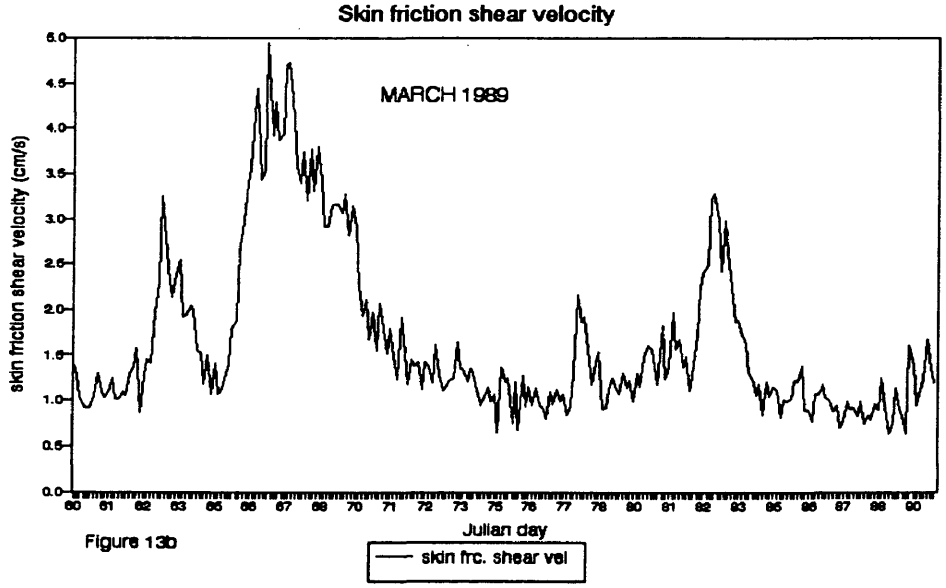


Figure 13b

Wave shear velocity and Current shear velocity

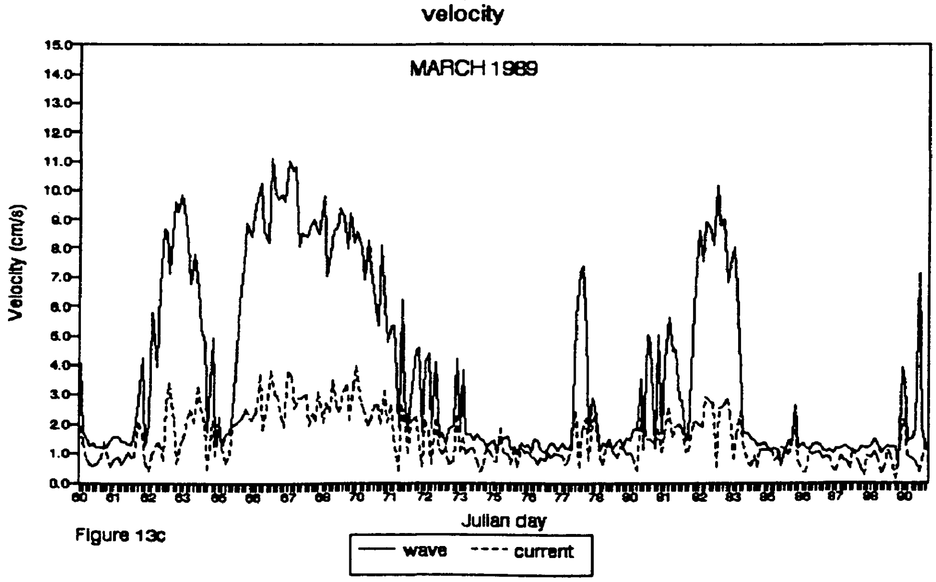


Figure 13c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

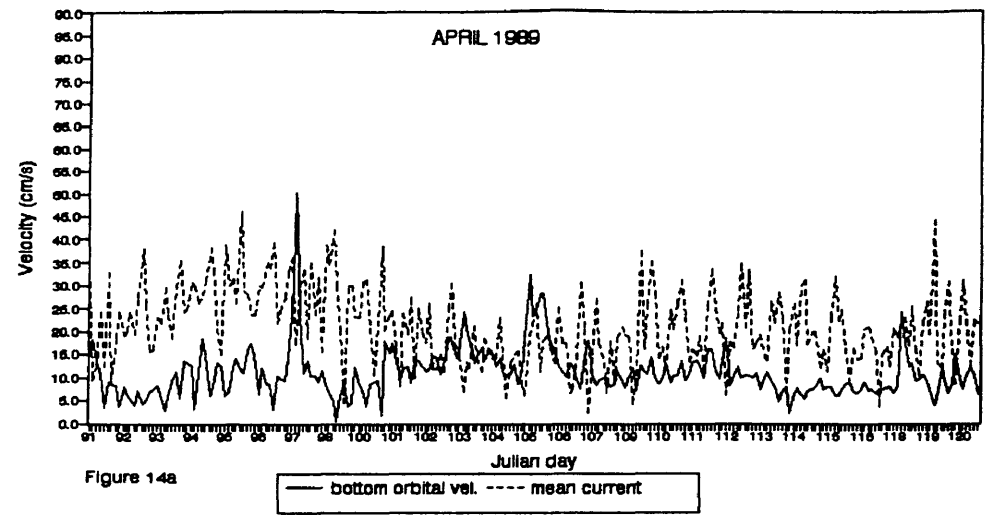


Figure 14a

Skin friction shear velocity

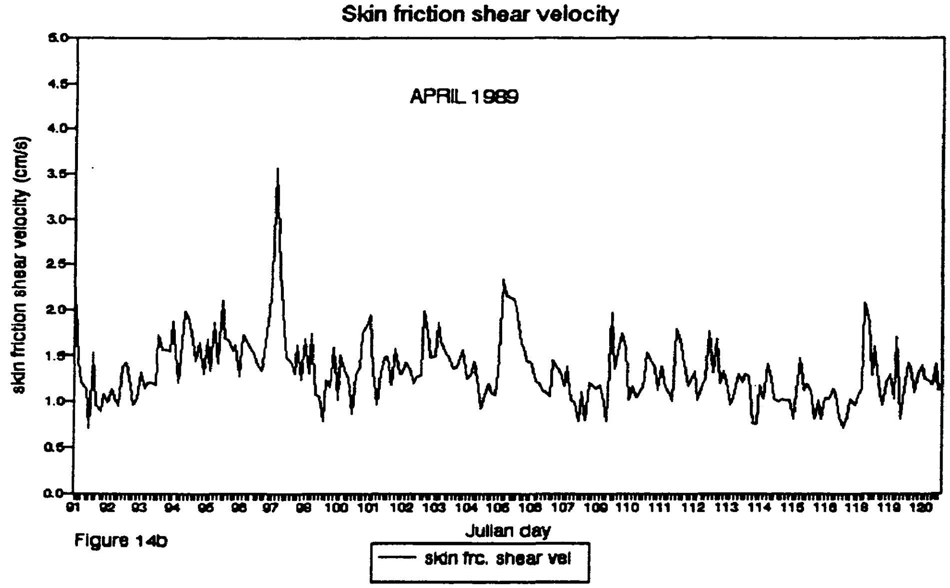


Figure 14b

Wave shear velocity and Current shear velocity

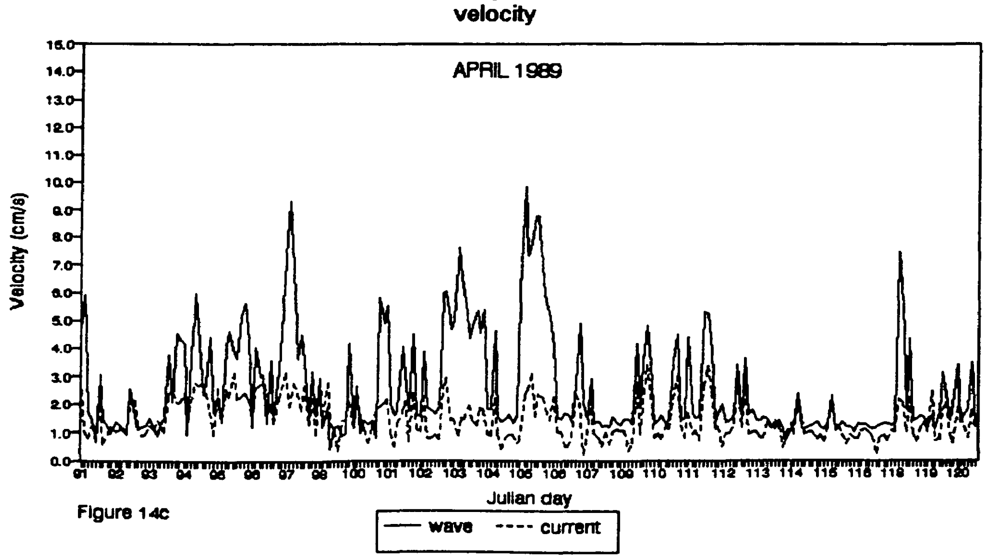


Figure 14c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

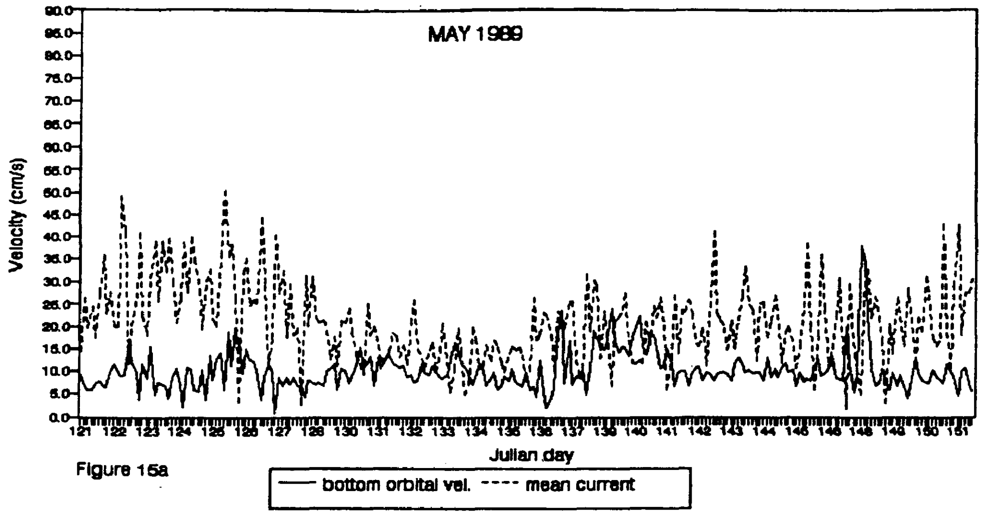


Figure 15a

Skin friction shear velocity

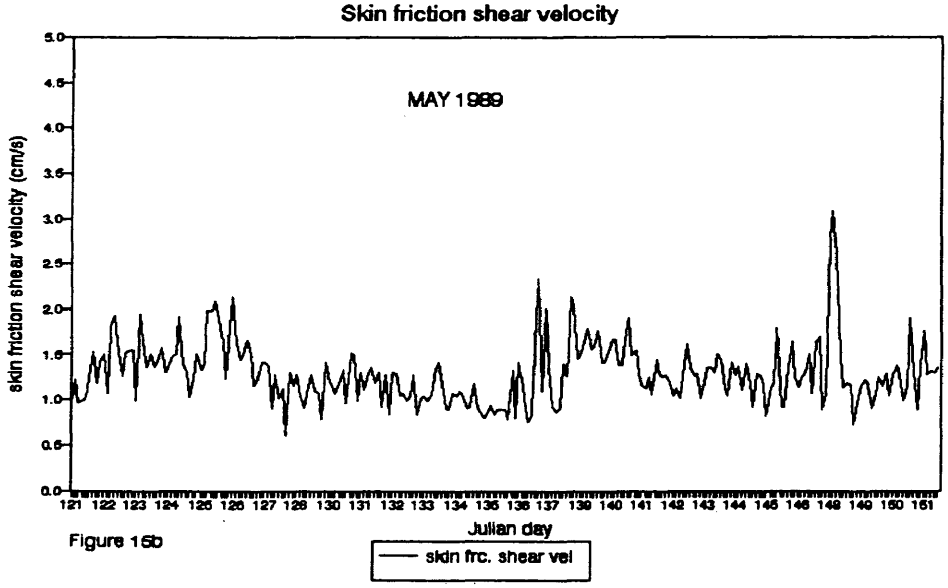


Figure 15b

Wave shear velocity and Current shear velocity

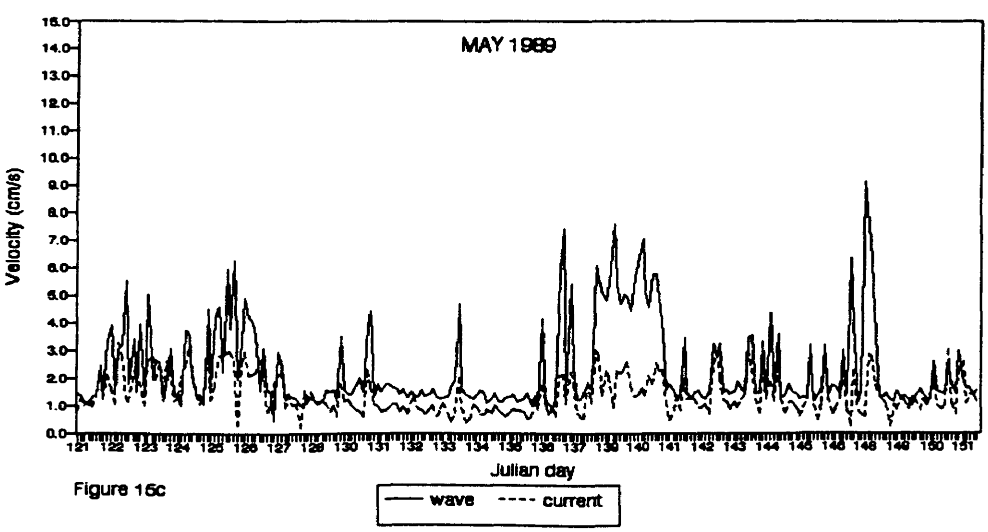


Figure 15c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

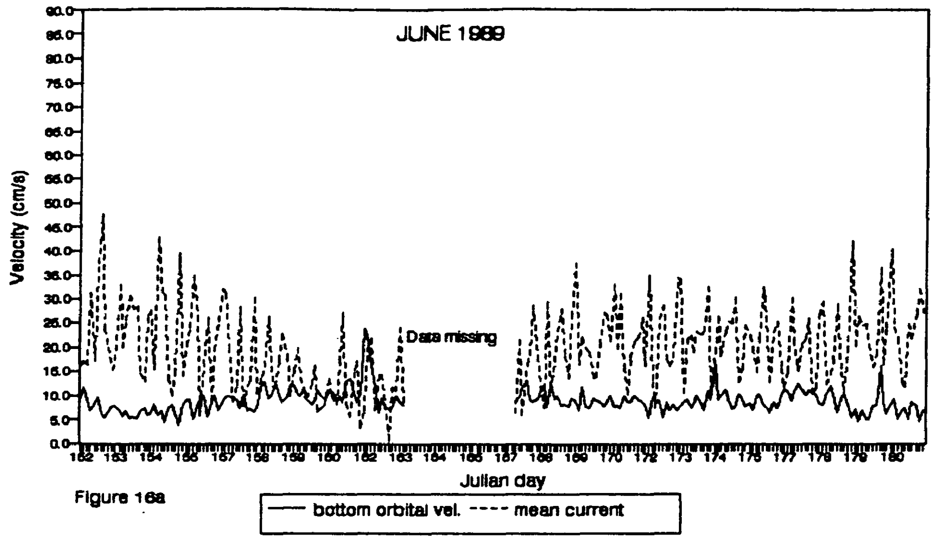


Figure 16a

Skin friction shear velocity

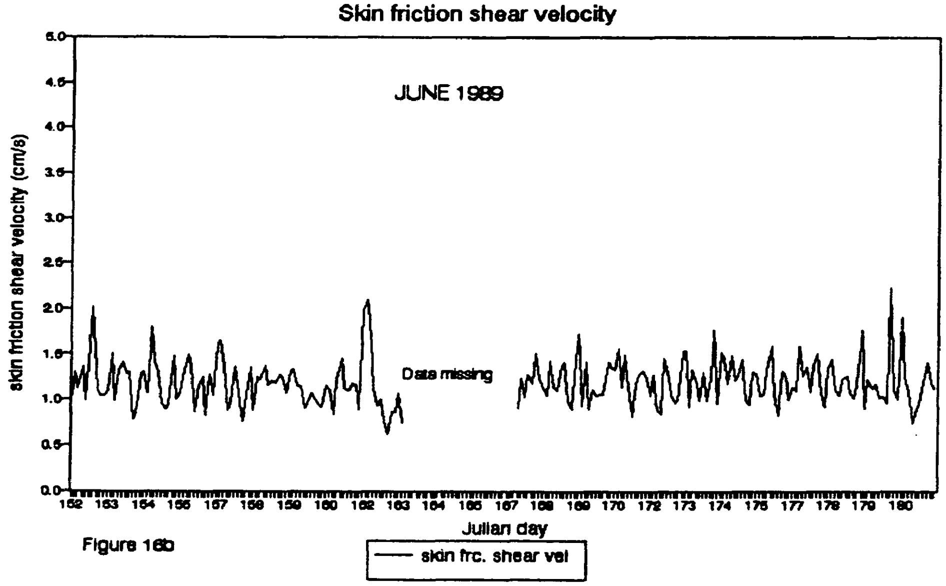


Figure 16b

Wave shear velocity and Current shear velocity

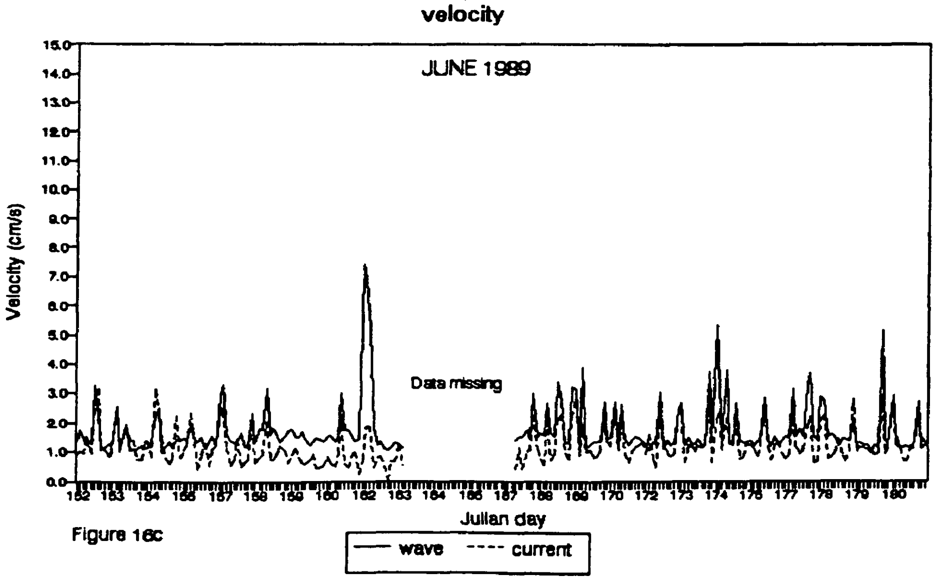


Figure 16c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

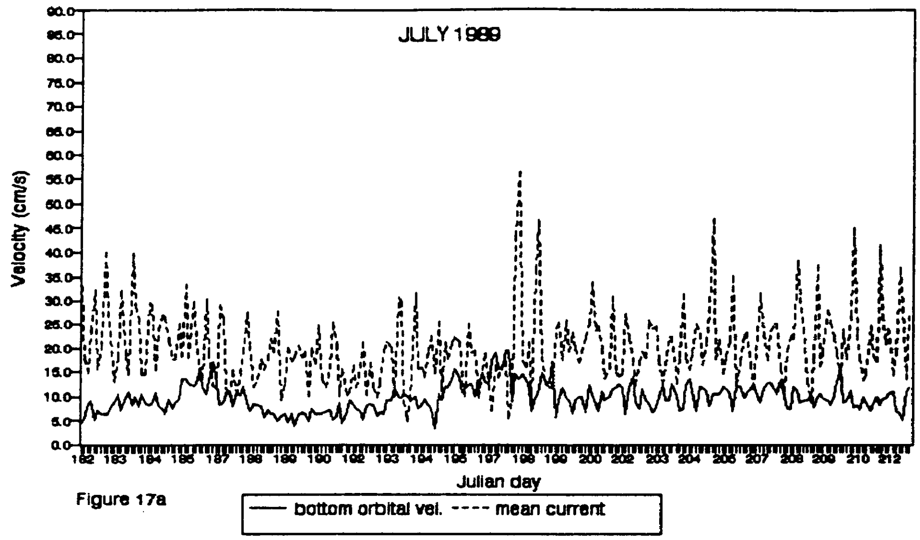


Figure 17a

Skin friction shear velocity

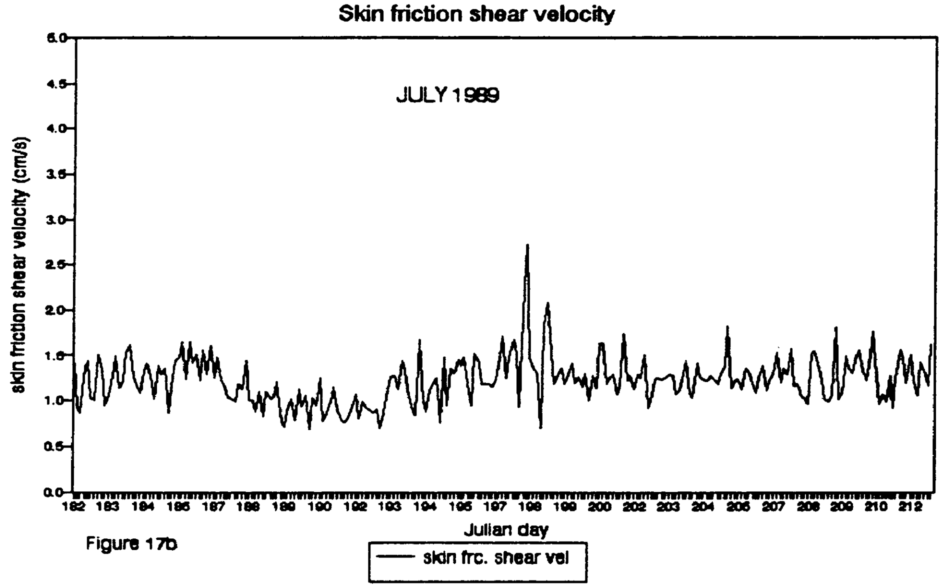


Figure 17b

Wave shear velocity and Current shear velocity

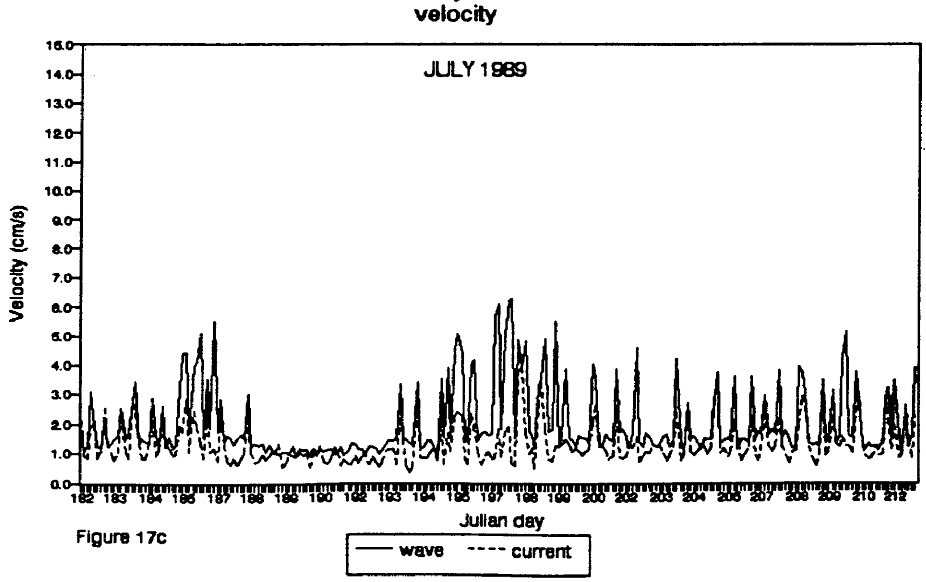


Figure 17c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

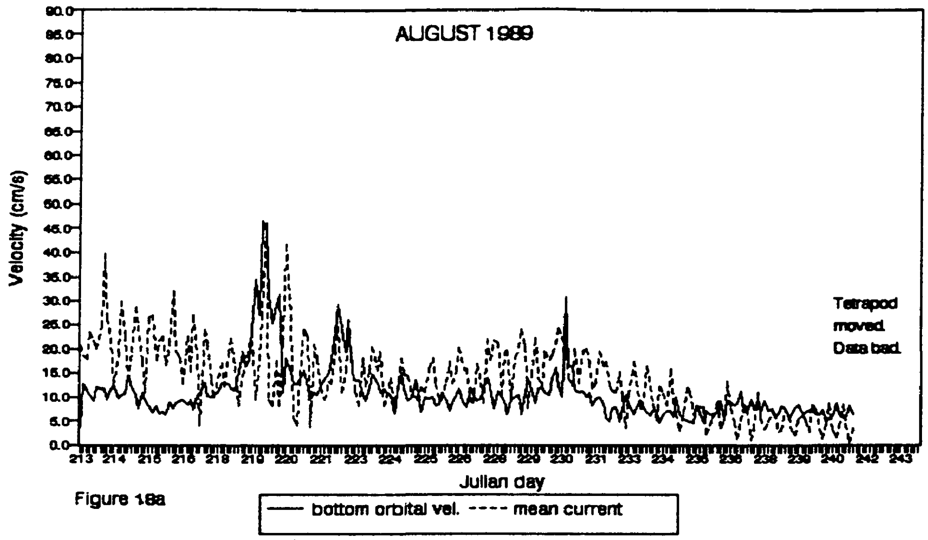


Figure 18a

Skin friction shear velocity

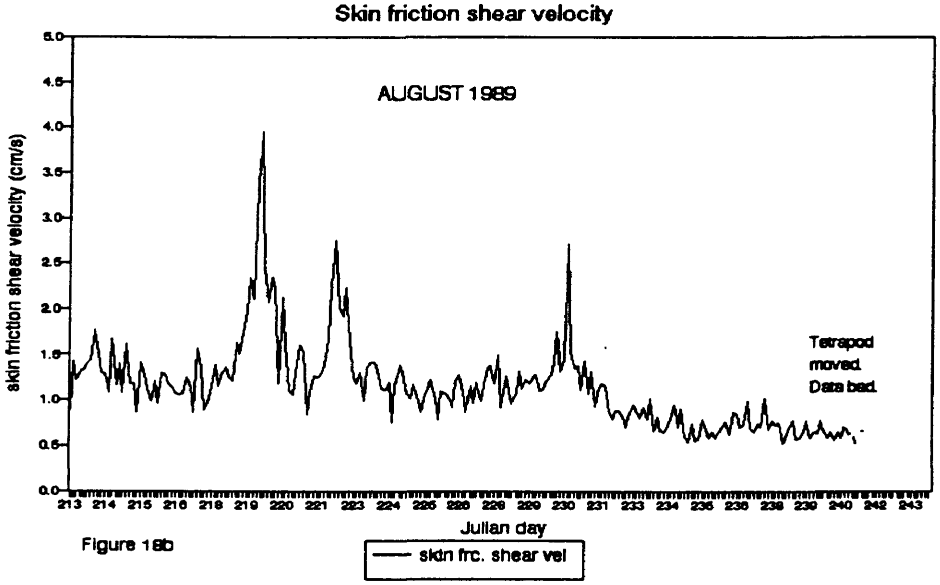


Figure 18b

Wave shear velocity and Current shear velocity

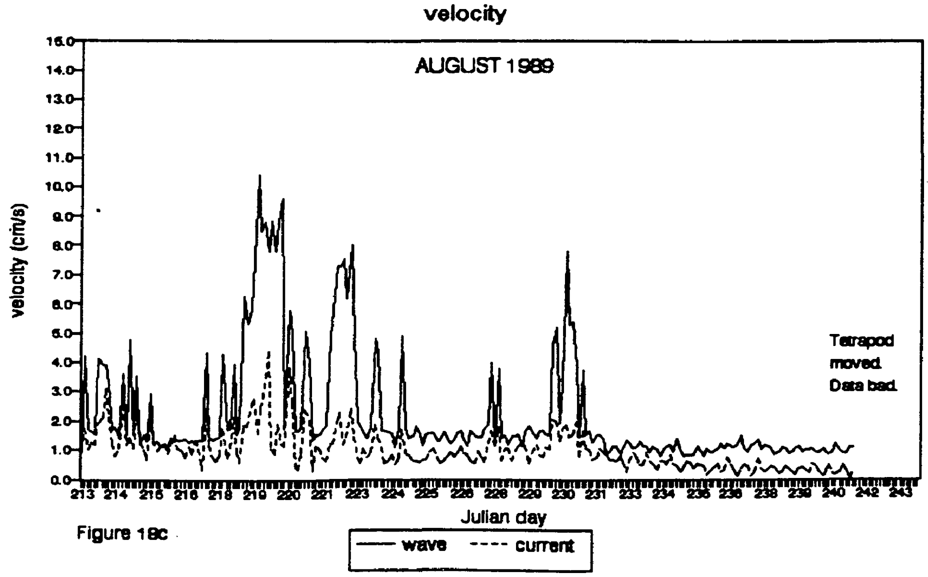


Figure 18c

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

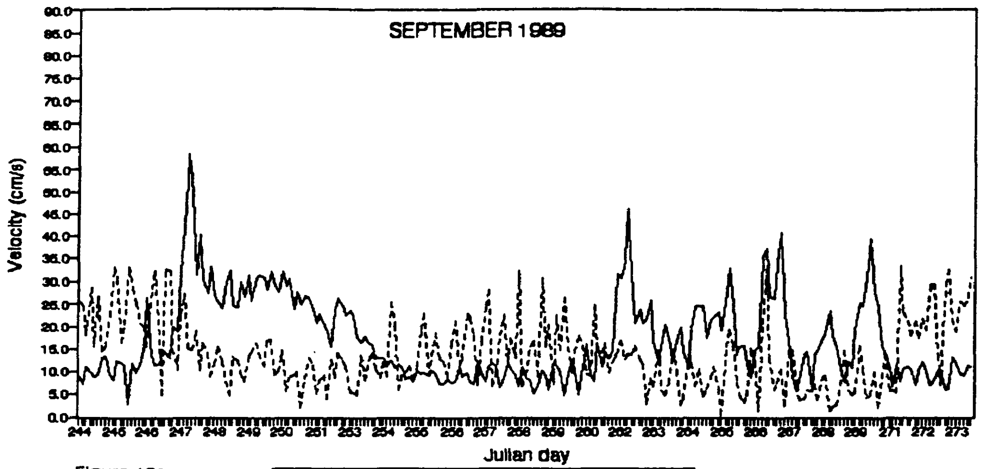


Figure 19a

— bottom orbital vel. ---- mean current

Skin friction shear velocity

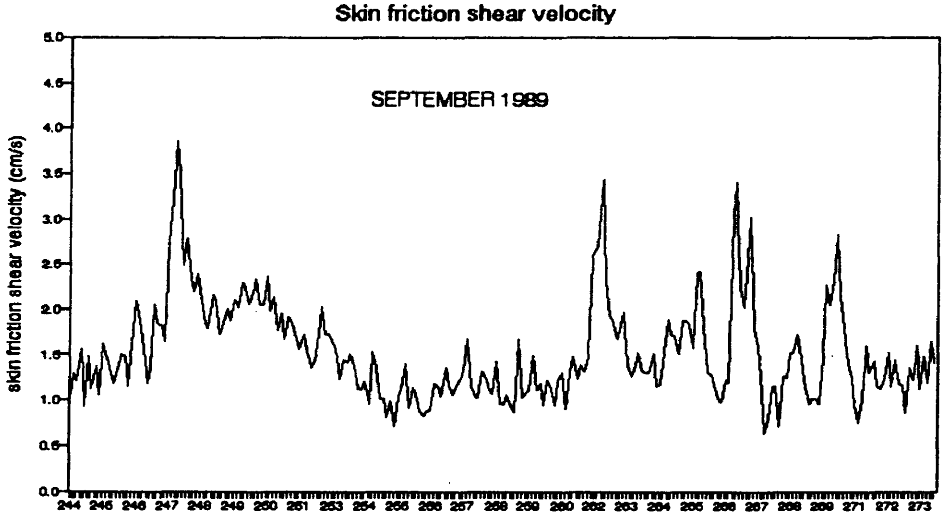


Figure 19b

— skin frc. shear vel

Wave shear velocity and Current shear velocity

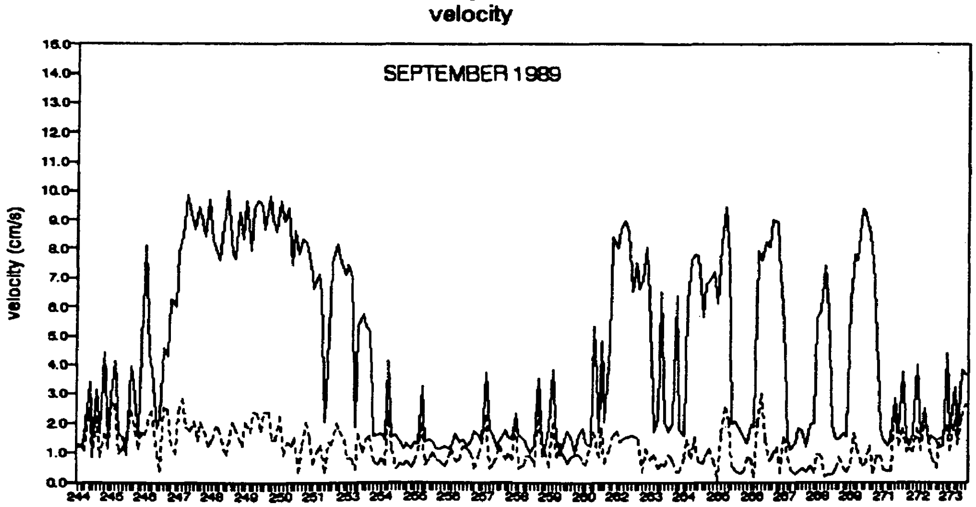


Figure 19c

— wave ---- current

Thimble Shoals Hydrodynamic regime
Bottom orbital velocity & Mean current

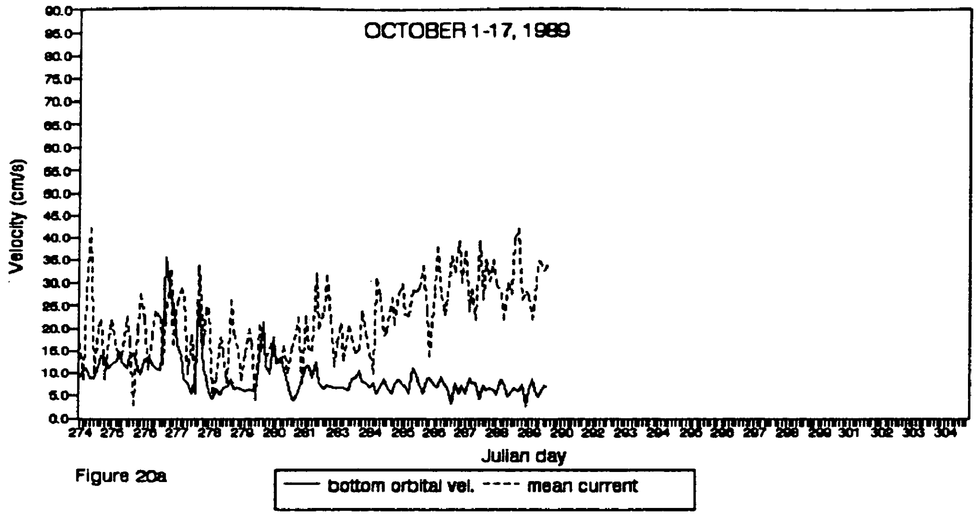


Figure 20a

Skin friction shear velocity

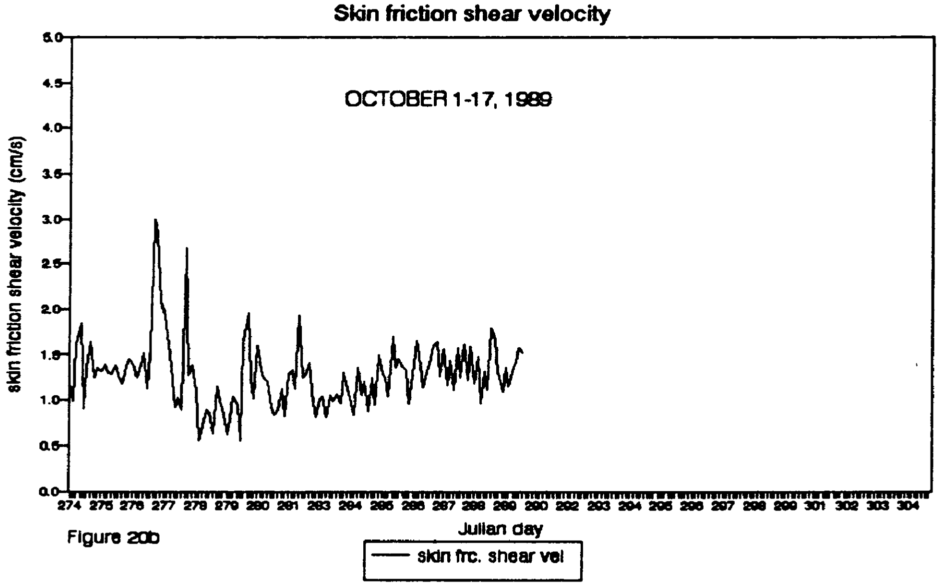


Figure 20b

Wave shear velocity and Current shear velocity

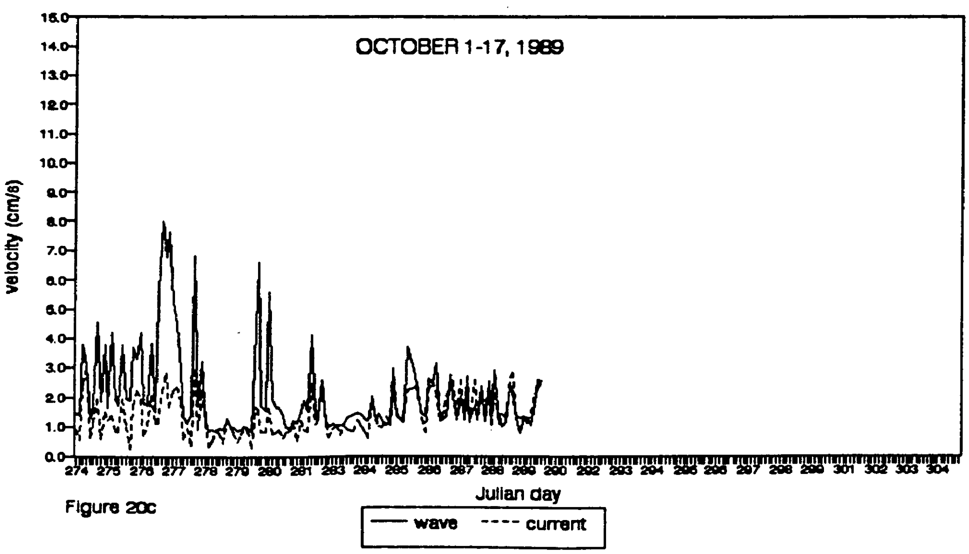


Figure 20c

JAN89, APR89, MAY89, and AUG89), peaks in U_b values fell between 40 cm/s - 50 cm/s. For 2 months of measurements (JUN89 and JUL89), peaks in U_b values reached only 20 cm/s - 25 cm/s. During the remaining 3 months (FEB89, MAR89, and SEP89), peaks in U_b values were significantly higher - 90 cm/s, 68 cm/s, and 60 cm/s respectively. In FEB89 and MAR89, peaks in U_b values occurred mainly during the major local winter storms. SEP89 was a particularly energetic month in terms of wave heights generated. No noteworthy local storms occurred in SEP89; however, two very large hurricanes did occur. Hurricane Gabrielle occurred between August 30, 1989, and September 13, 1989, with maximum wind speeds of 125 knots. Hurricane Hugo occurred between September 10-22, 1989, with maximum wind speeds of 140 knots.

Figures 8-20 (b) depict graphically the frictional result of the hydrodynamic forcings just described. These figures show time series plots of the combined wave-current skin friction shear velocity, $U_{*cw(f)}$, as estimated using the Grant and Madsen (1986) model, for the months October, 1988, through October, 1989. Equation 9 in the background section of this study was used for the estimation of $U_{*cw(f)}$, where roughness was based solely on sediment grain diameter. The combined skin friction shear velocity is shown here as it is that portion of the total bed shear which is actually responsible for moving the bed sediments. Thus, whenever peaks in $U_{*cw(f)}$ occur, peaks in the predicted resuspension will also occur; these will be instances when the largest magnitudes of sediment will be mobilized from the bed. A comparison of the plots (a) and (b) for each month demonstrates which velocity component (U_b or U_c) contributing to the combined shear, $U_{*cw(f)}$, may be more responsible for moving the sediments at the bed.

For all months except JUN89 and JUL89, sharp peaks in the skin friction shear velocity are mirrored by similar sharp peaks in the equivalent orbital velocity amplitude, U_b. In JUN89, the skin friction shear velocity remained at relatively low values (mainly between 0.5 cm/s - 1.5 cm/s) throughout the month. Throughout JUN89, U_b also remained at relatively low values (5 cm/s - 10 cm/s). In JUL89, the skin friction shear velocity was slightly higher overall than in JUN89 (between 0.5 cm/s - 2.0 cm/s). During this month, two sharp peaks in $U_{*cw(f)}$ occur at JDAY198. When compared to the hydrodynamic plots for JUL89, it may be noted that similar sharp peaks occur in mean current at this time. The peaks in U_c are likely the cause of the peaks noted in $U_{*cw(f)}$, in terms of the model calculations for $U_{*cw(f)}$. In nature; however, peaks such as these in mean current velocity are highly unusual, and those noted for JUL89 are likely some other factor influencing the data. During almost all other months, small peaks in $U_{*cw(f)}$ occur which may correspond to similar small peaks in U_c. When these peaks in U_c exceed 20 cm/s, it may be that the mean current is responsible for any sediment motion at the bed.

In order to more directly address the role of currents in sediment resuspension at Thimble Shoals, time series plots of the model predicted wave shear velocity and current shear velocity are shown in Figures 8-20 (c). A comparison of these plots with those for $U_{*cw(f)}$ (8-20 (b)) indicates which shear velocity component is likely the greater contributor to the combined shear velocity and thus likely responsible for the sediment resuspension. Throughout all months, the wave shear velocity remains greater than the current shear velocity. For the majority of all months, the current shear velocity remains between 1 cm/s and 2 cm/s and never exceeds 5 cm/s. The wave shear velocity fluctuates between approximately 1 cm/s and 5 cm/s, with much larger increases during times of increased bottom orbital velocity (plots (a)). During instances of likely large magnitudes of sediment resuspension, where sharp peaks and groups of peaks in $U_{*cw(f)}$ are noted, similar sharp peaks in the wave shear velocity of up to 15 cm/s also occur.

Comparison of the three plots presented for each month indicates that whenever large sharp peaks in $U_{*cw(f)}$ occur, similar large sharp peaks in wave orbital velocity and in wave shear velocity also occur. This leads to the conclusion that whenever large magnitudes of sediment are resuspended from the bed at Thimble Shoals, waves are largely responsible. As mentioned earlier, this conclusion is what would be expected from a wave-dominated environment as Grant and Madsen's (1986) model assumes. It is important to remember; however, that even in wave-dominated environments, the mean current velocity in the vicinity of the wave boundary layer may at times exceed the bottom orbital velocity and may thus be the cause of sediment motion. As indicated, instances may be noted throughout the year when U_b is small, and small peaks in U_c occur which are relatively larger than U_b. These peaks in U_c were noted to often be greater than 20 cm/s, and to potentially correspond to small peaks in $U_{*cw(f)}$. During these times of the year, it may be that the mean current is more likely moving the bed sediments. Relative to the resuspension due to U_b; however, instances of sediment resuspension at Thimble Shoals due to the mean current are likely to be much less frequent and of much smaller magnitudes.

RESULTS

Roughness

Tables 6a & 6b contain the predicted and observed ripple dimensions (height, η, and length, λ) and the predicted and observed ripple roughness, k_{br}. Both predicted and observed k_{br} were calculated using equation 13; however, model predicted η and λ were used in calculating the predicted k_{br}, and observed η and λ were used in calculating the observed k_{br}. For the observed data, the only slides available for which corresponding real wave and current data were also available were 6 slides taken on November 3, 1988. Upon viewing the slides, only 4 of the 6 contained ripples which could be accurately measured. The model predicted ripple dimensions and predicted k_{br} are shown for November 2, 1988, and November 3, 1988.

Based on the real wave and current data for November 3rd, the model predicted that no ripples would develop and thus that k_{br} = 0. Ripples which would actually be observed on November 3rd would be the last ripples formed by sufficiently strong flow conditions. The model predicts the most recent ripples to have developed on November 2, 1988, during the last burst of the day (21:00 hours). Comparison of ripple dimensions observed on November 3rd and those predicted for November 2nd show large differences. The predicted height for 21:00 hours is 2-2.5 times larger than the observed heights, and the predicted length is also 2-2.5 times larger than those observed. The predicted ripple roughness of 16.44 cm is approximately 2 times the average k_{br} of 8.47 cm calculated using the observed ripple dimensions.

Table 6a. Predicted ripple dimensions and ripple roughness

Date	Time (hr)	ripple height (cm)	ripple length (cm)	ripple roughness (cm)
11-02-88	0	4.79	30.32	20.94
11-02-88	3	4.58	28.86	20.17
11-02-88	6	0.00	0.00	0.00
11-02-88	9	4.84	31.21	20.80
11-02-88	12	0.00	0.00	0.00
11-02-88	15	6.09	38.14	26.89
11-02-88	18	0.00	0.00	0.00
11-02-88	21	3.79	24.18	16.44
11-03-88	0	0.00	0.00	0.00
11-03-88	3	0.00	0.00	0.00
11-03-88	6	0.00	0.00	0.00
11-03-88	9	0.00	0.00	0.00
11-03-88	12	0.00	0.00	0.00
11-03-88	15	0.00	0.00	0.00
11-03-88	18	0.00	0.00	0.00
11-03-88	21	0.00	0.00	0.00

Table 6b. Observed ripple dimensions (from 03Nov88 slides)

Date	Time (pm)	ripple height (cm)	ripple length (cm)	Slide
11-03-88	?	dimensions not measurable		A
11-03-88	3:24	1.55	12.38	B
11-03-88	3:26	1.90	10.00	C
11-03-88	3:27	dimensions not measurable		D
11-03-88	3:28	1.90	12.14	E
11-03-88	3:30	1.90	9.76	F

Predicted total resuspension

Figures 21-33 contain time series of the predicted resuspension (using equation 18) for each month through the year OCT88-OCT89. Resuspension shown in these figures is the total amount of sediment mobilized per unit area of bed for the mean sediment grain size and for all waves regardless of direction or frequency. Julian day is shown on the x-axis, with each tick mark representing one burst (8 bursts per day, approximately 240 bursts per month). These figures provide a visual representation of relative changes in predicted resuspension throughout the year. Tables 7a and 7b summarize the predicted resuspension information in terms of frequency and magnitude for each month. Frequency is calculated as the total number of bursts in which sediment was predicted to be mobilized divided by the total number of bursts for the month. Magnitude is given in terms of the monthly mean and monthly maximum amounts of predicted resuspension. The cumulative resuspension (Table 7b) is the cumulative amount of sediment predicted to be resuspended for each month. It is calculated by adding the predicted resuspension for all bursts throughout each month. It represents the net effect of both frequency and magnitude of predicted resuspension (i.e., the number of resuspension events predicted to occur plus the predicted magnitudes for each of those resuspension events).

In terms of frequency of resuspension (Table 7a), some expected as well as some unexpected results may be observed. The month during which the most frequent sediment resuspension was predicted was SEP89, in which nearly half of the bursts (46%) predicted resuspension. The next most frequent resuspension was predicted for OCT88 and MAR89, (40% and 39% respectively). The least frequent resuspension was predicted for JUN89, JUL89, and AUG89, (between 12% - 17% of the bursts). Frequencies of predicted resuspension for the remaining months, (NOV88, DEC88, JAN89, FEB89, APR89, and MAY89), all fell within a mid-range of values between

Table 7a. Frequency and magnitude of the total volume of sediment mobilized per unit area of bed for both wave energy components.

Month	Frequency	Mean resuspension (cm /cm)	Maximum resuspension (cm /cm)
OCT88	0.40	0.006	0.029
NOV88	0.23	0.006	0.041
DEC88	0.22	0.007	0.036
JAN89	0.29	0.007	0.025
FEB89	0.30	0.019	0.111
MAR89	0.39	0.018	0.074
APR89	0.30	0.005	0.036
MAY89	0.24	0.004	0.025
JUN89	0.12	0.003	0.010
JUL89	0.17	0.003	0.018
AUG89	0.13	0.008	0.045
SEP89	0.46	0.008	0.042
OCT89	0.23	0.005	0.023

Table 7b. Cumulative volume of sediment mobilized per unit area of bed, for each month.

Month	Cumulative resuspension (cm /cm)
OCT88	0.641
NOV88	0.321
DEC88	0.360
JAN89	0.529
FEB89	1.262
MAR89	1.749
APR89	0.335
MAY89	0.277
JUN89	0.099
JUL89	0.136
AUG89	0.267
SEP89	0.875
OCT89	0.152

Figures 21-33. Monthly time series of total predicted sediment resuspension, regardless of direction or frequency, for October, 1988, through October, 1989.

TOTAL RESUSPENSION

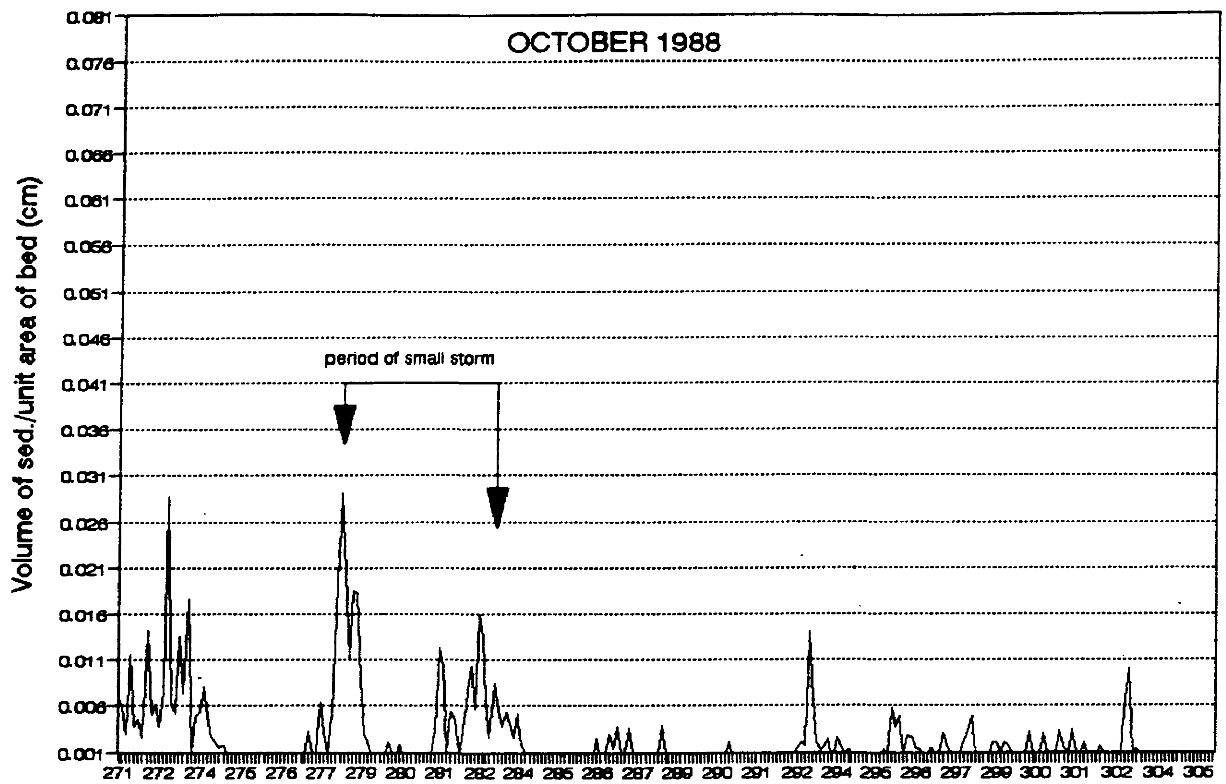


Figure 21

TOTAL RESUSPENSION

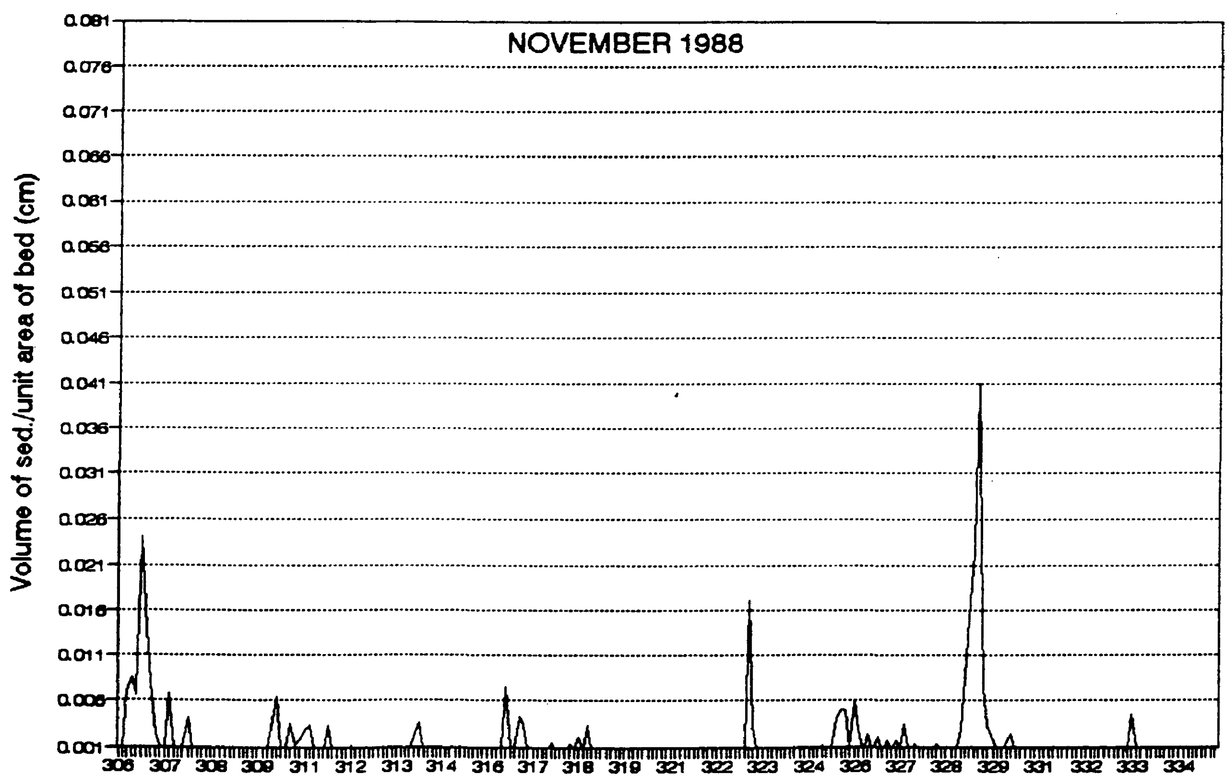


Figure 22

TOTAL RESUSPENSION

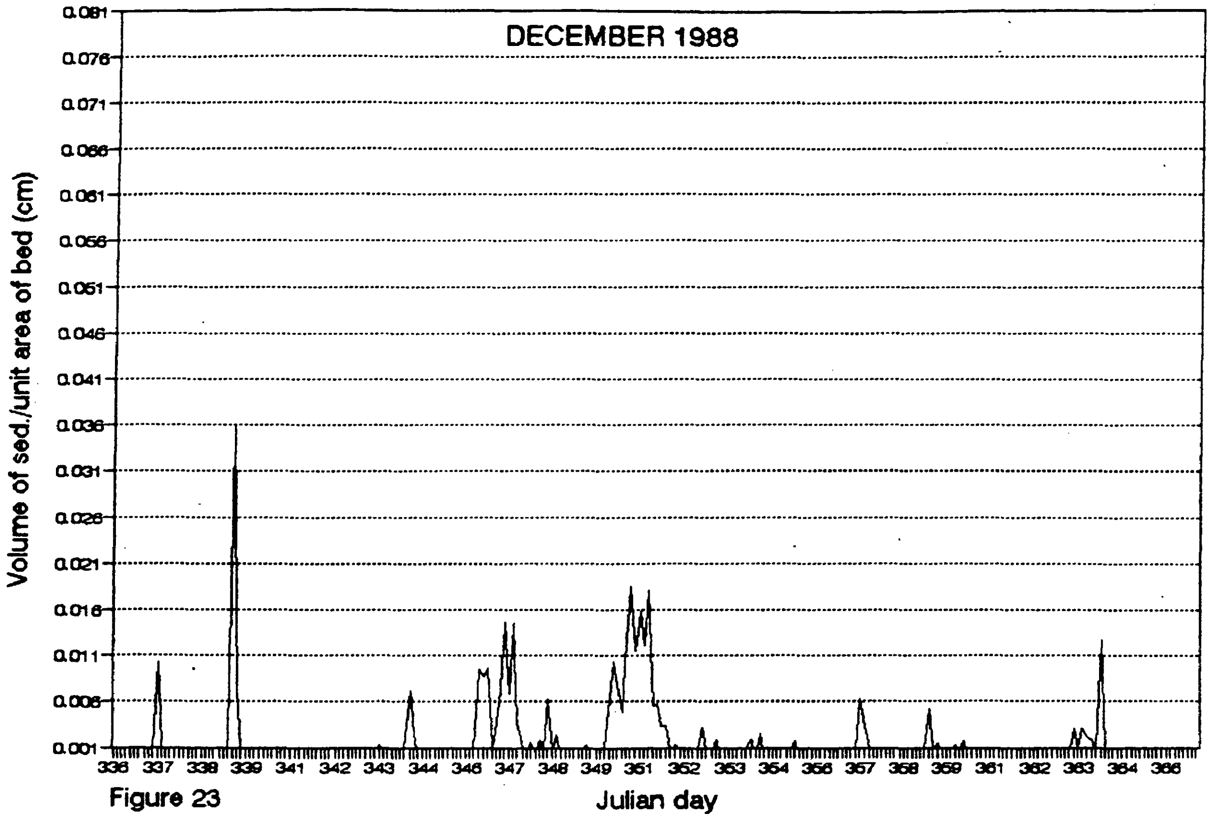


Figure 23

TOTAL RESUSPENSION

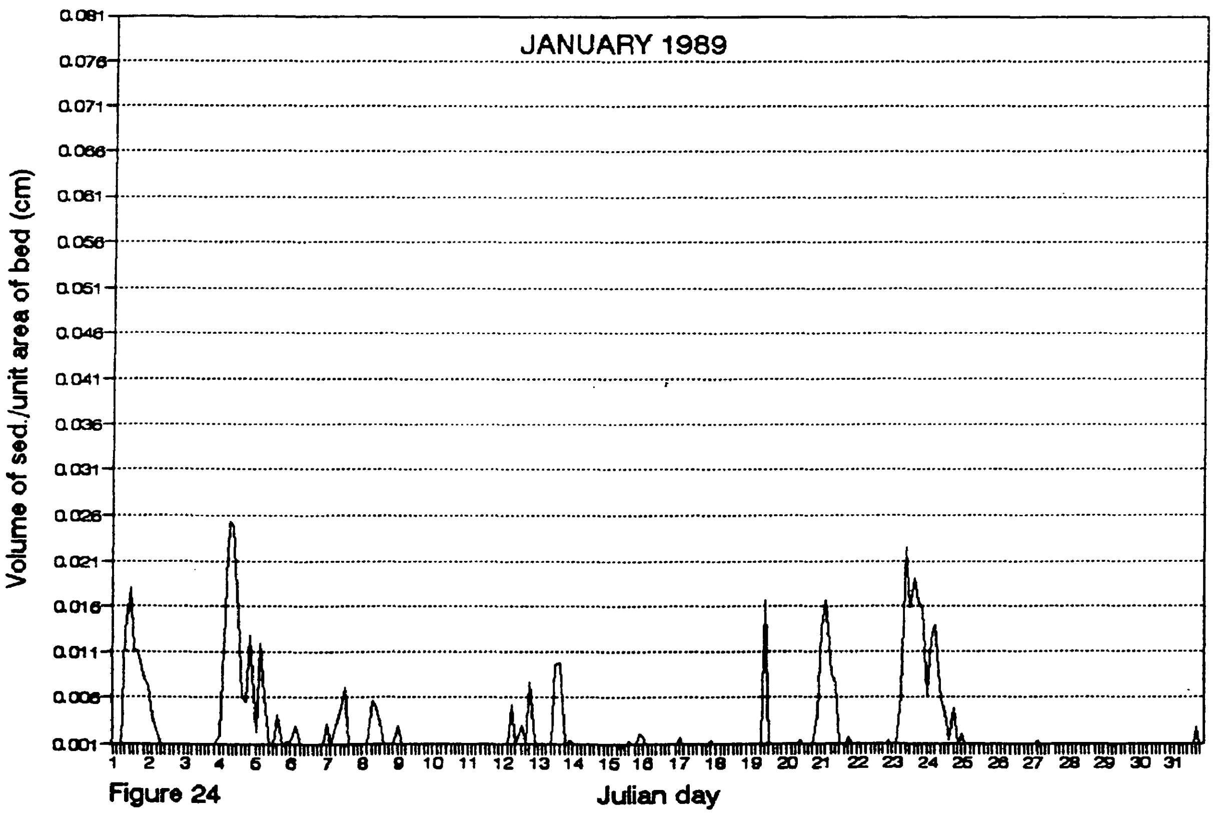


Figure 24

TOTAL RESUSPENSION

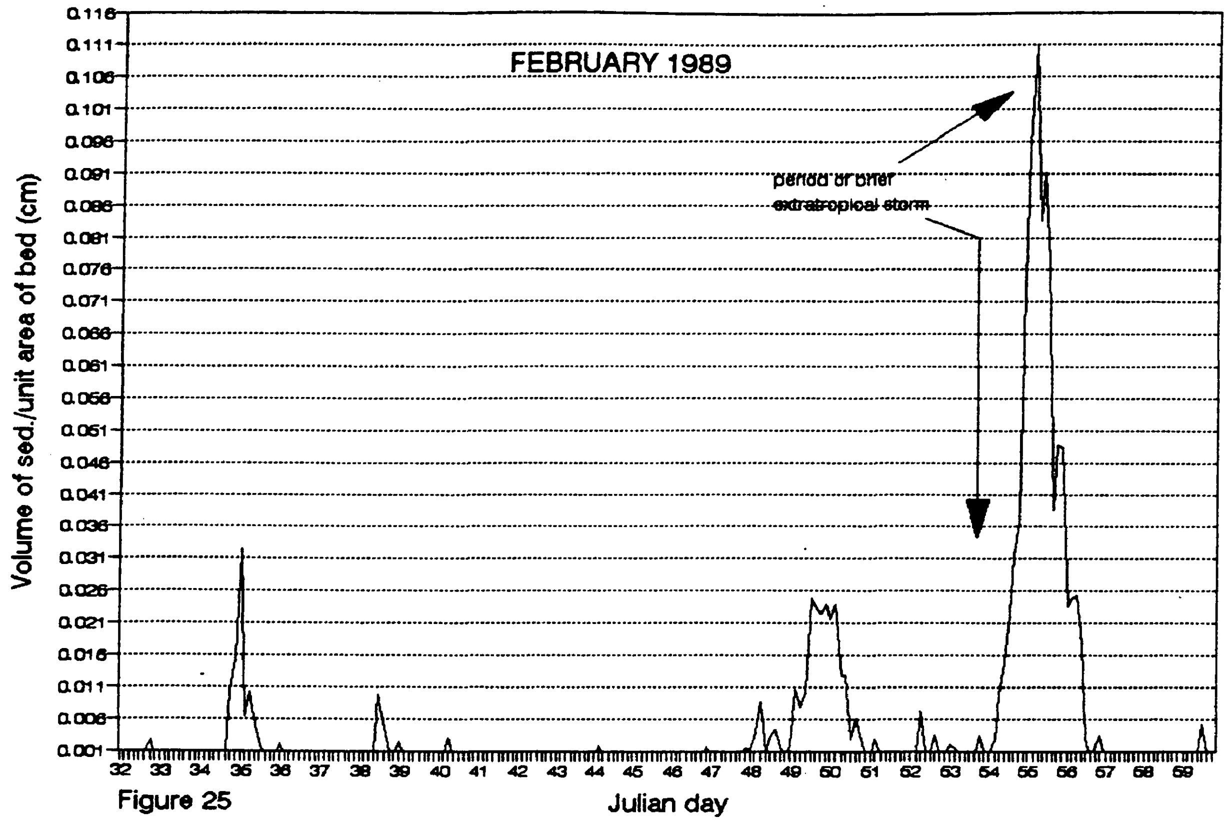


Figure 25

TOTAL RESUSPENSION

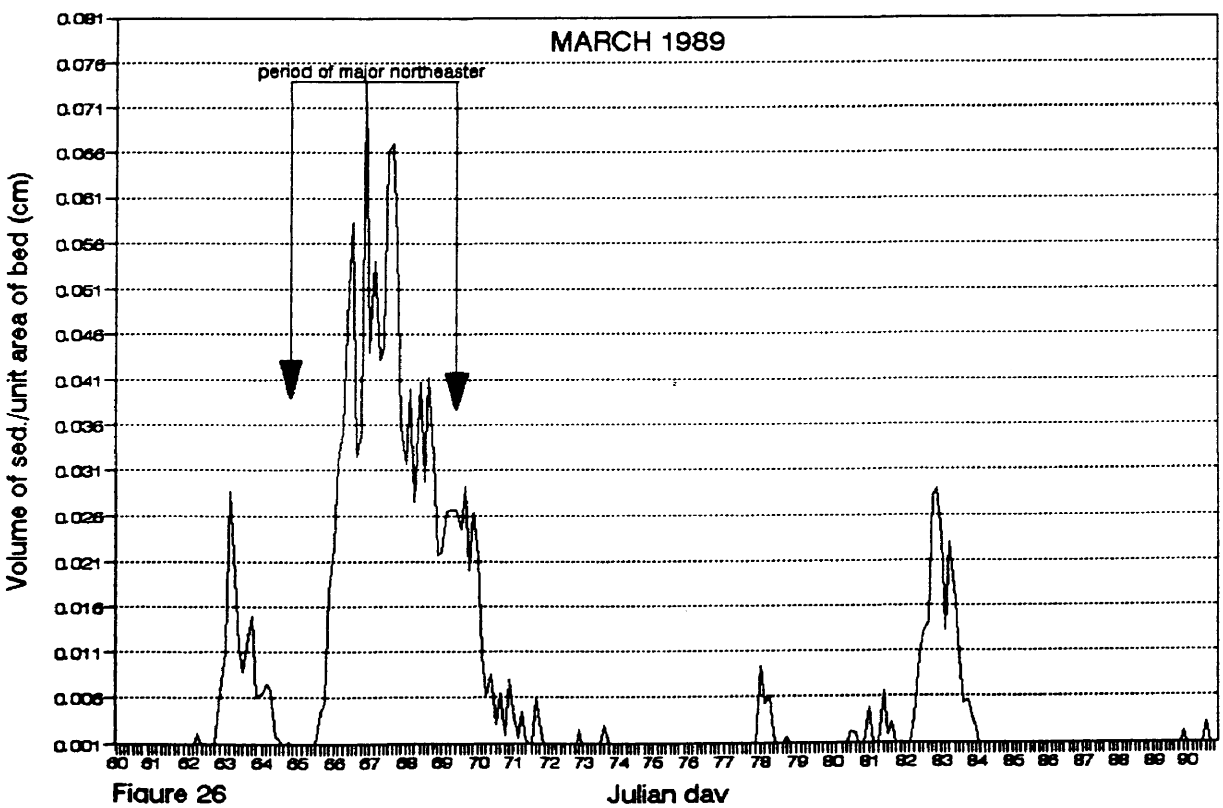


Figure 26

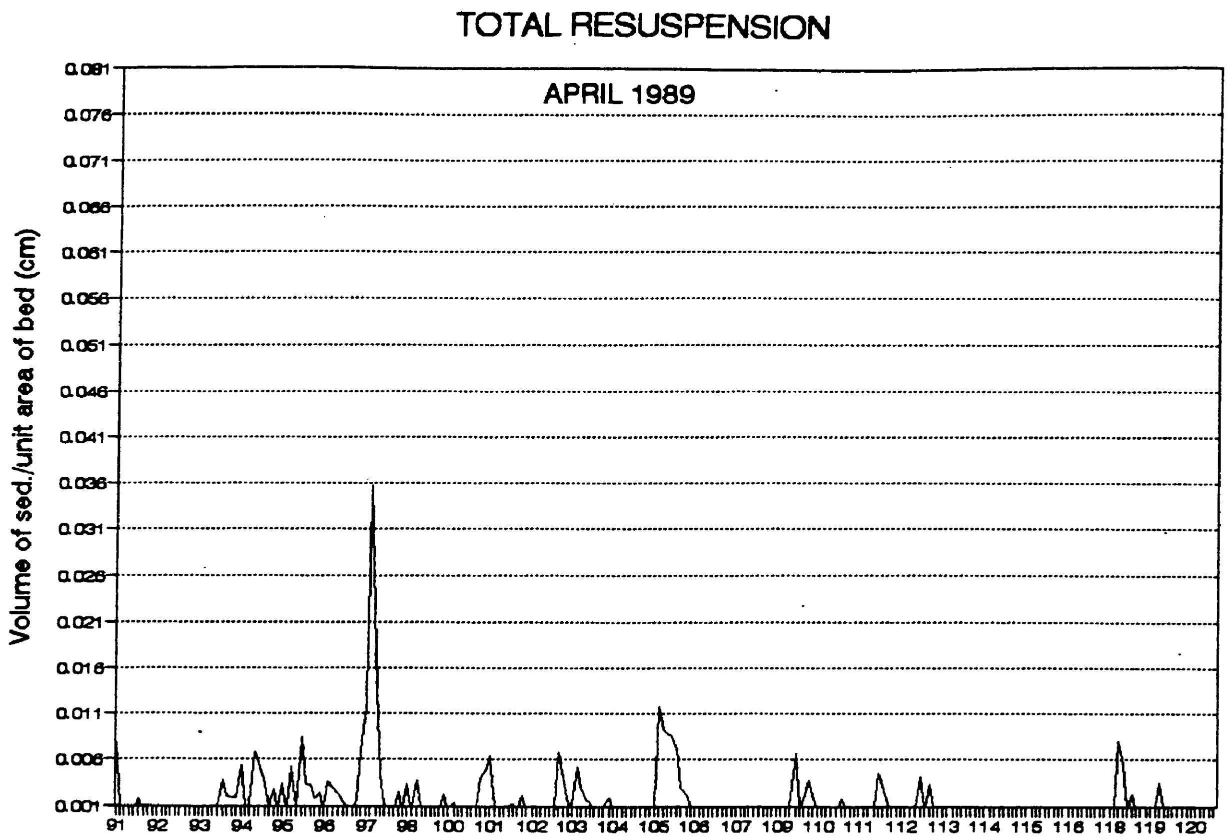


Figure 27

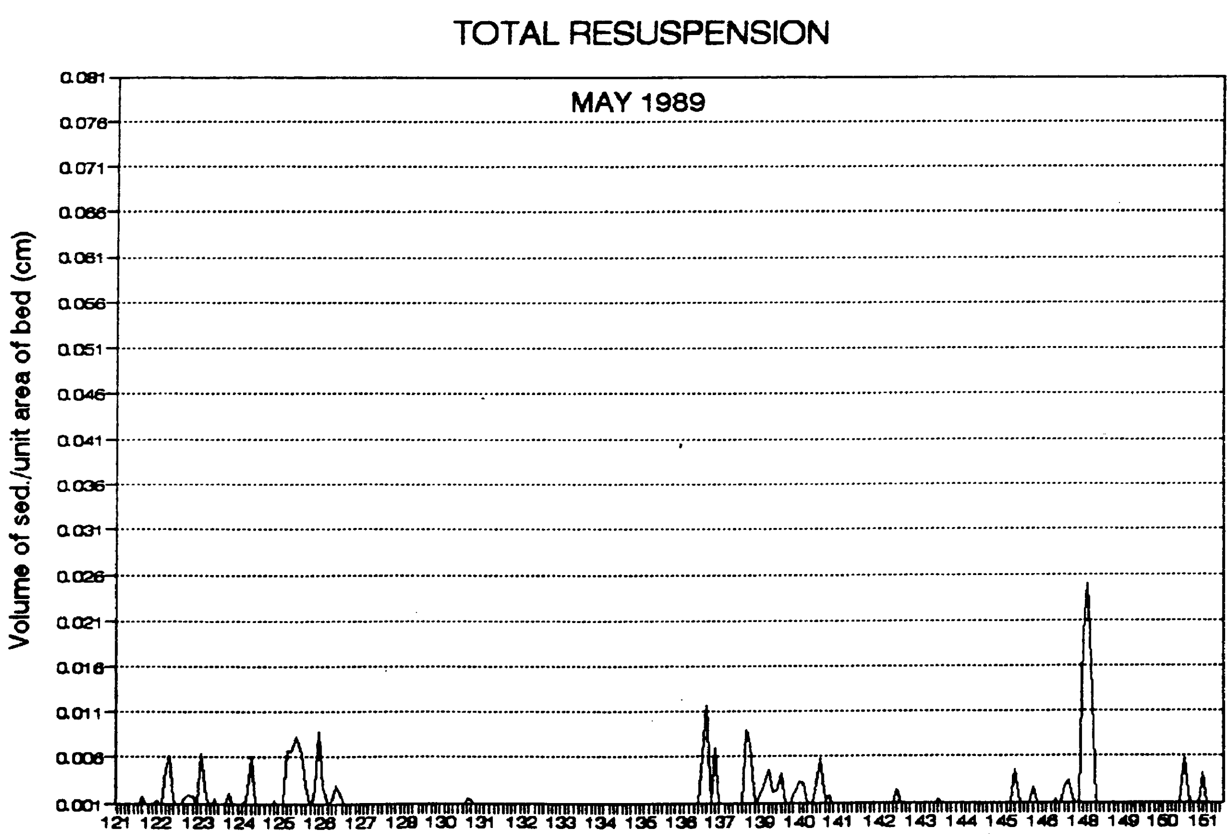


Figure 28

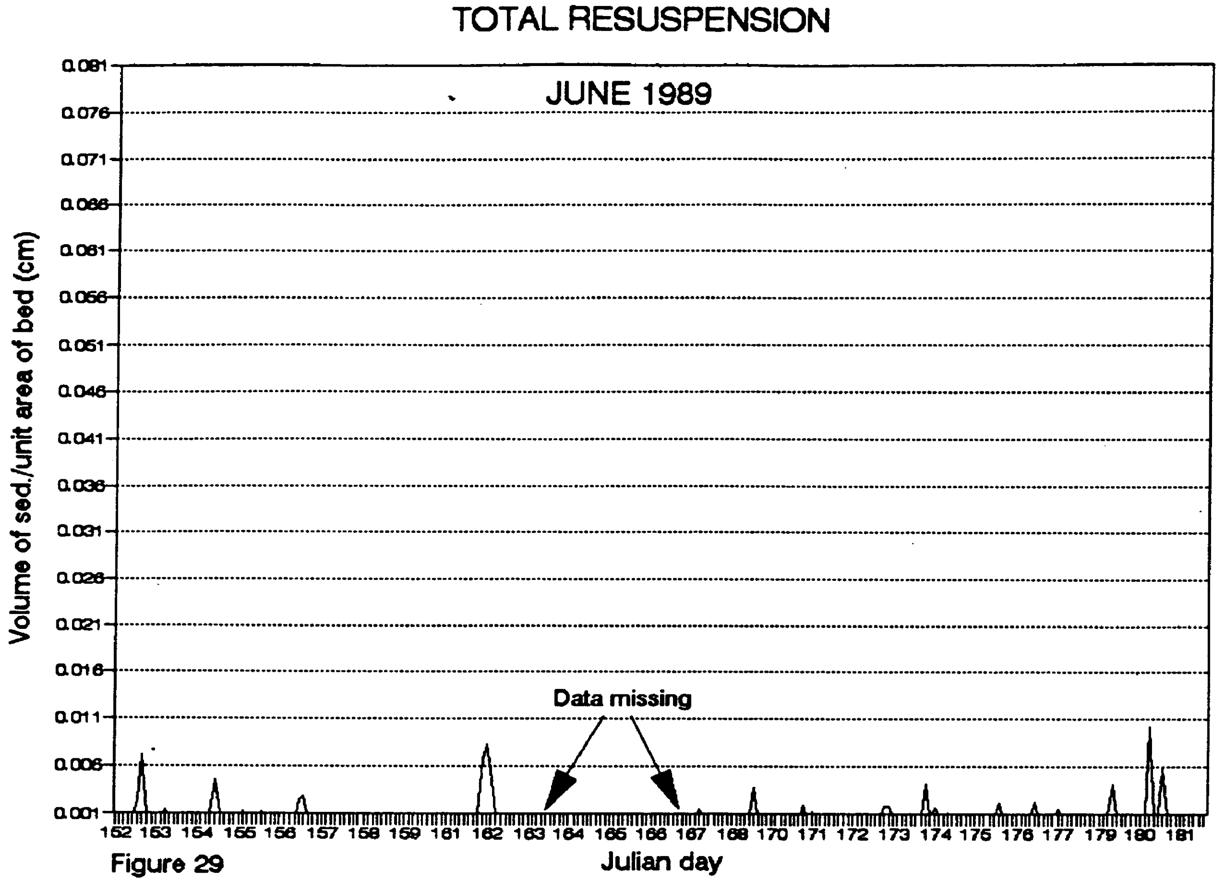


Figure 29

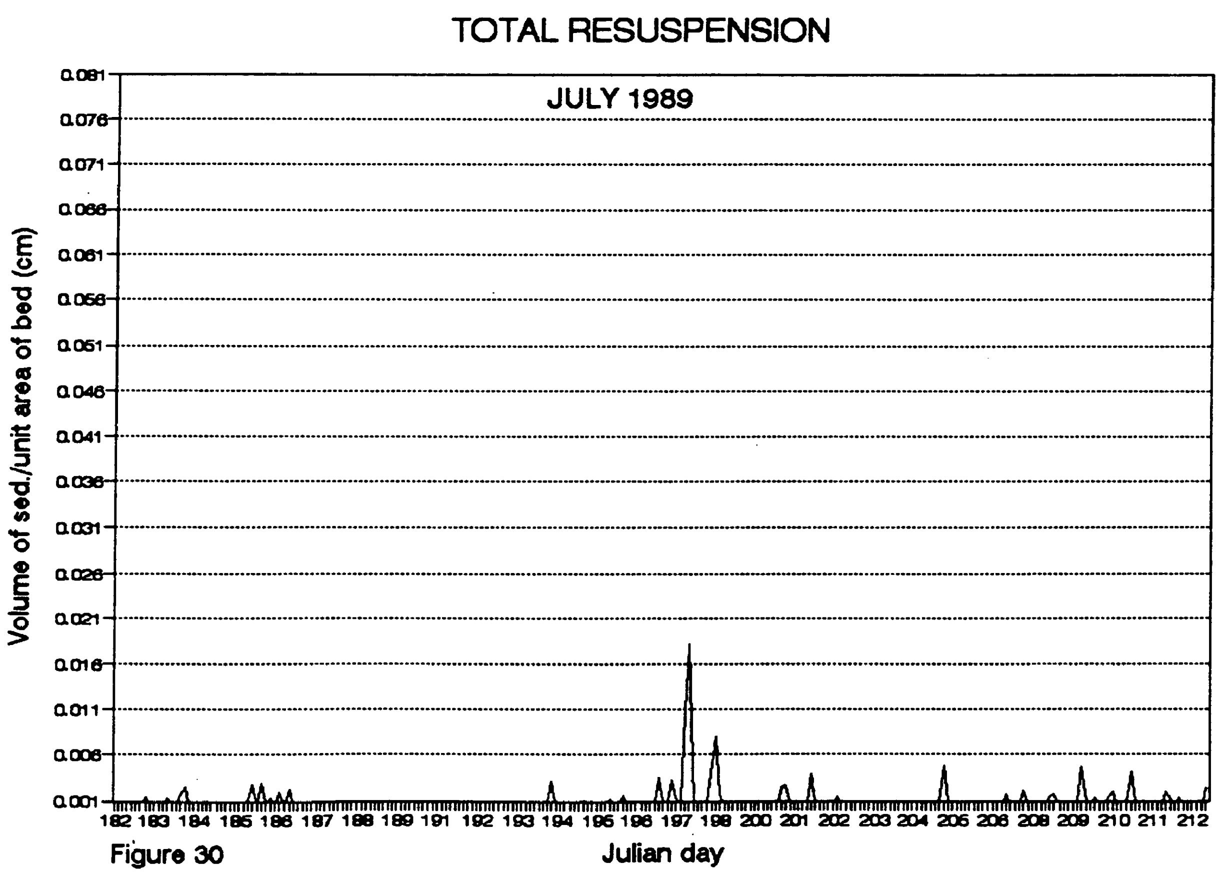


Figure 30

TOTAL RESUSPENSION

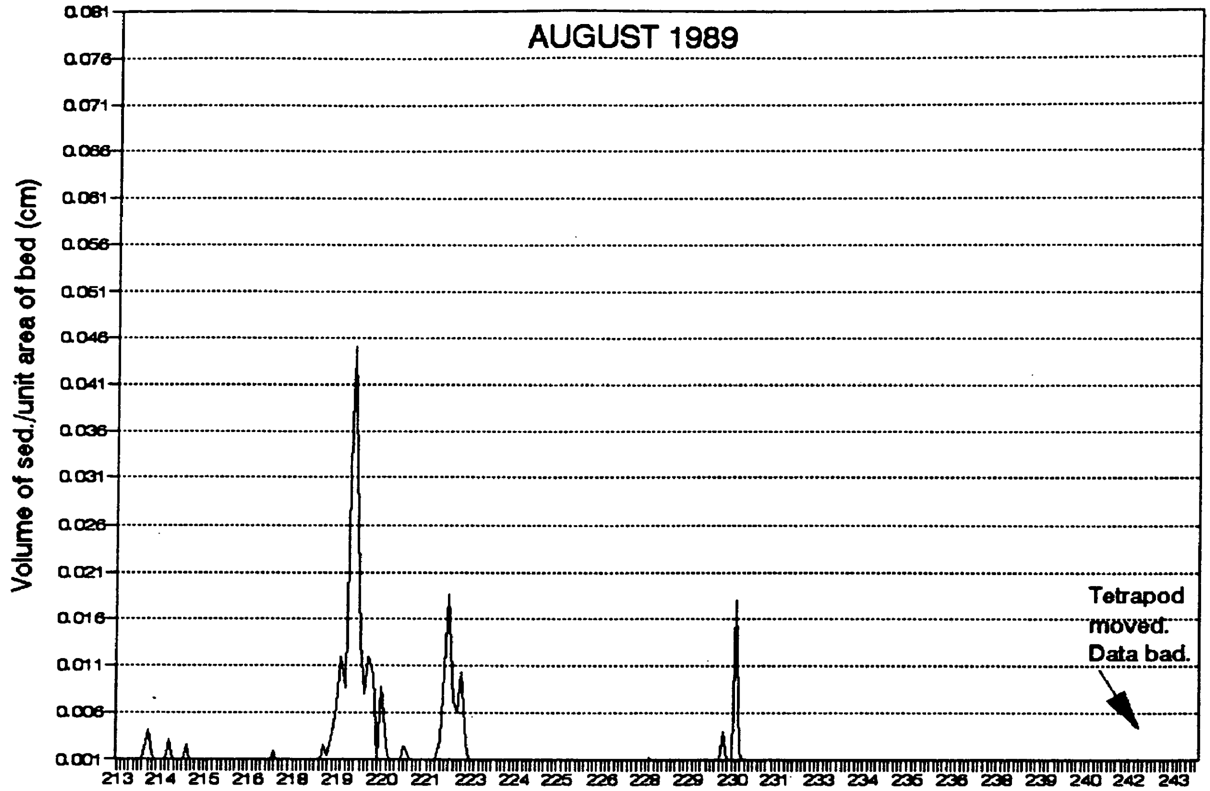


Figure 31

TOTAL RESUSPENSION

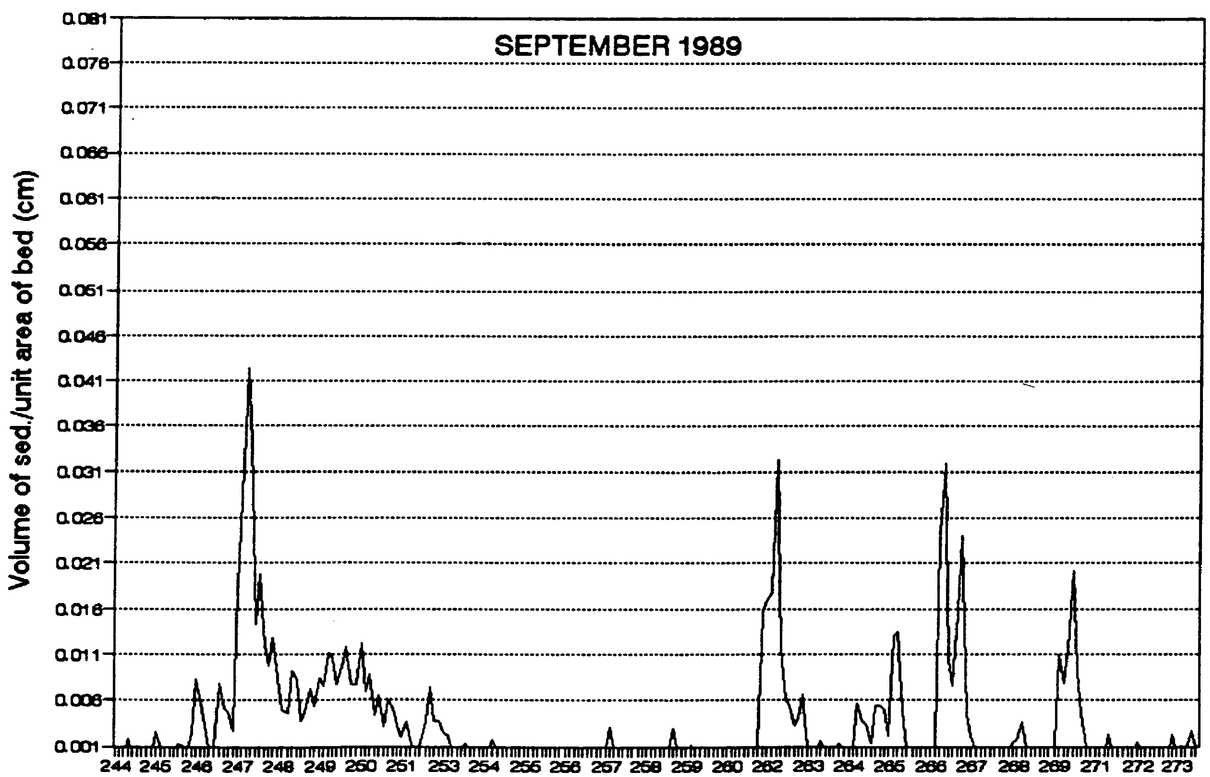
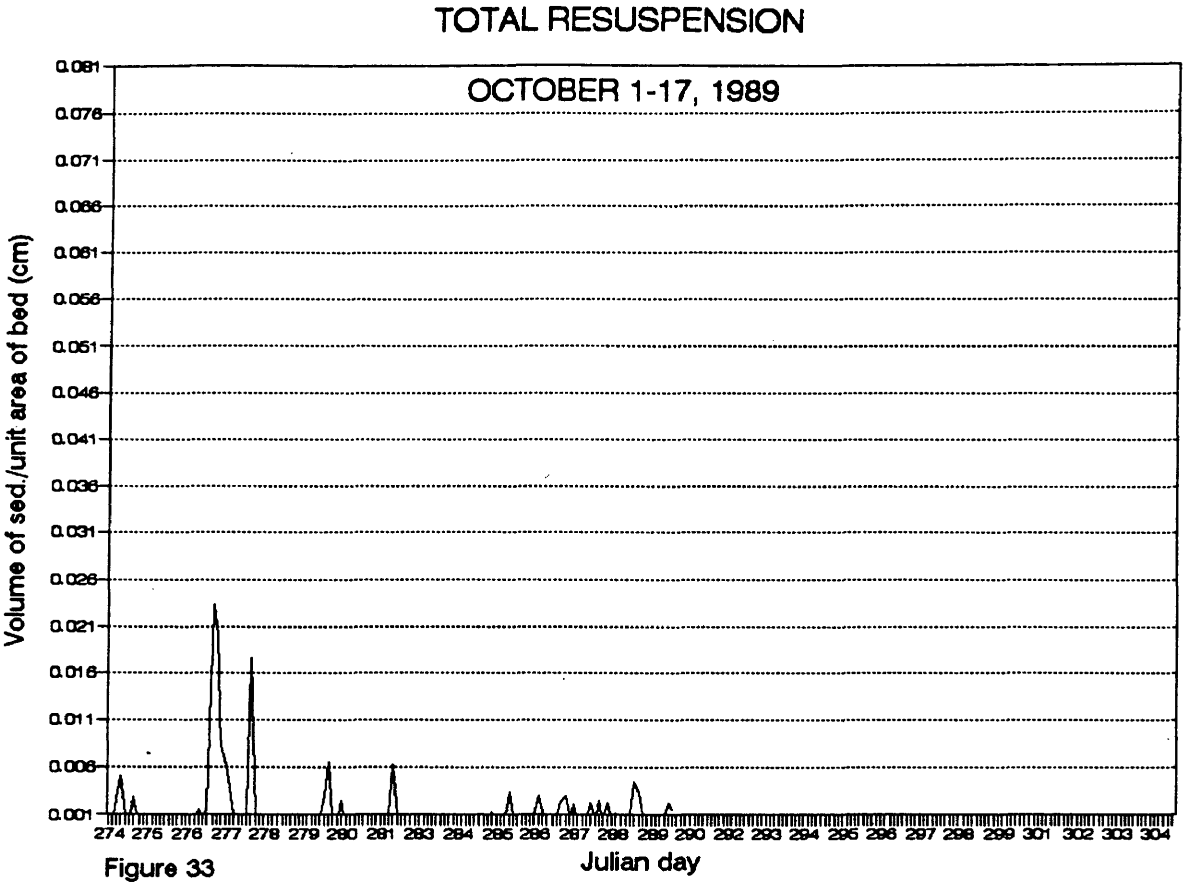


Figure 32


TOTAL RESUSPENSION
OCTOBER 1-17, 1989
Volume of sed./unit area of bed (cm)
0.081
0.076
0.071
0.066
0.061
0.056
0.051
0.046
0.041
0.036
0.031
0.026
0.021
0.016
0.011
0.006
0.001
274 275 276 277 278 279 280 281 283 284 285 286 287 288 289 290 292 293 294 295 296 297 298 299 301 302 303 304
Julian day
Figure 33

22% and 30%. During JAN89, FEB89, and APR89 frequencies were at the high end of this range (29%, 30%, and 30% respectively), while those for NOV88, DEC88, and MAY89 were at the low end (23%, 22%, and 24% respectively).

The greatest mean amounts of predicted resuspension (Table 7a) were for FEB89 and MAR89 (0.019 cm^3/cm^2 and 0.018 cm^3/cm^2 respectively). During these two months, major winter storms occurred. The next greatest mean amounts of predicted resuspension were for AUG89 and SEP89 (0.008 cm^3/cm^2 for both months). A minor hurricane occurred in AUG89, while two major hurricanes occurred in SEP89. The smallest mean amounts of predicted resuspension were for JUN89 and JUL89 (0.003 cm^3/cm^2 for both months). The mean amount of predicted resuspension for MAY89 was slightly higher at 0.004 cm^3/cm^2, and that predicted for APR89 was a bit higher than MAY89 (0.005 cm^3/cm^2). The remaining months (OCT88-JAN89) had mean amounts of predicted resuspension in a mid-range of values (0.006 cm^3/cm^2 for OCT88 and NOV88, and 0.007 cm^3/cm^2 for DEC88 and JAN89). Of these 4 months, OCT88 was the only month during which a noted storm did occur; however, it was significantly smaller in terms of wave height than the storms which occurred in FEB89 and MAR89.

Results for the monthly maximum amount of predicted resuspension (Table 7a) were generally similar to those for the monthly mean. The greatest maximum amounts of predicted resuspension were in FEB89 and MAR89 (0.111 cm^3/cm^2 and 0.074 cm^3/cm^2 respectively). The next greatest maximum amounts of predicted resuspension were in AUG89 and SEP89 (0.045 cm^3/cm^2 and 0.042 cm^3/cm^2 respectively). The smallest maximum amounts of predicted resuspension were for JUN89 and JUL89 (0.010 cm^3/cm^2 and 0.018 cm^3/cm^2 respectively). The maximum amounts of predicted resuspension for the remaining months (OCT88-JAN89, APR89, and MAY89) fell within a mid-range of values (between 0.025 cm^3/cm^2 and 0.041 cm^3/cm^2). NOV88, DEC88, and APR89 were at the high end of this range (0.041 cm^3/cm^2, 0.036 cm^3/cm^2, and

0.036 cm^3/cm^2 respectively), while OCT88, JAN89, and MAY89 were at the low end (0.029 cm^3/cm^2, 0.025 cm^3/cm^2, and 0.025 cm^3/cm^2 respectively).

The predicted cumulative resuspension (Table 7b) represents the net effect of the predicted frequencies and magnitudes of sediment resuspension. The greatest predicted cumulative resuspension values were for FEB89 and MAR89 (1.749 cm^3/cm^2 and 1.262 cm^3/cm^2 respectively). The next greatest predicted cumulative resuspension was for SEP89 with a value of 0.875 cm^3/cm^2. The smallest predicted cumulative resuspension values were for JUN89 and JUL89 (0.099 cm^3/cm^2 and 0.136 cm^3/cm^2 respectively). Values for MAY89 and AUG89 were slightly higher (0.277 cm^3/cm^2 and 0.285 cm^3/cm^2 respectively). Within a mid-range of values (between 0.321 cm^3/cm^2 and 0.641 cm^3/cm^2) were the months of OCT88-JAN89 and APR89.

Sediment size-dependent resuspension

As mentioned earlier, grain size distributions for the Buckroe reserve and the TSC reserve portions of Thimble Shoals (reported by Kimball et al., 1989) were used in order to determine the characteristic coarse, mean, and fine grain sizes for each reserve (summary data from the grain size distributions were shown in Table 3). Based on the 21 Buckroe reserve distributions, the mean grain size was found to be 0.17 mm (2.5 phi). Grain size distributions were narrow, with an average standard deviation (SD) of 0.31 phi. For calculation of the coarse and fine grain sizes, +/- 2 SD were used. The coarse grain size was 0.27 mm (1.88 phi), and the fine grain size was 0.11 mm (3.12 phi). Based on the 9 TSC reserve distributions, the mean grain size was found to be 0.28 mm (1.8 phi). Distributions were broader than those of the Buckroe reserve, with an average SD of 0.54 phi. The coarse grain size was 0.60 mm (0.72 phi), and the fine grain size was 0.13 mm (2.9 phi).

Figures 34-40 contain time series of the predicted sediment size-

Figures 34-40. Time series of sediment size-dependent predicted resuspension for coarse, mean, and fine grain sizes of Buckroe reserve sediments. For OCT88, FEB89, MAR89, APR89, JUN89, AUG89, and SEP89.

TOTAL RESUSPENSION
grain size comparison

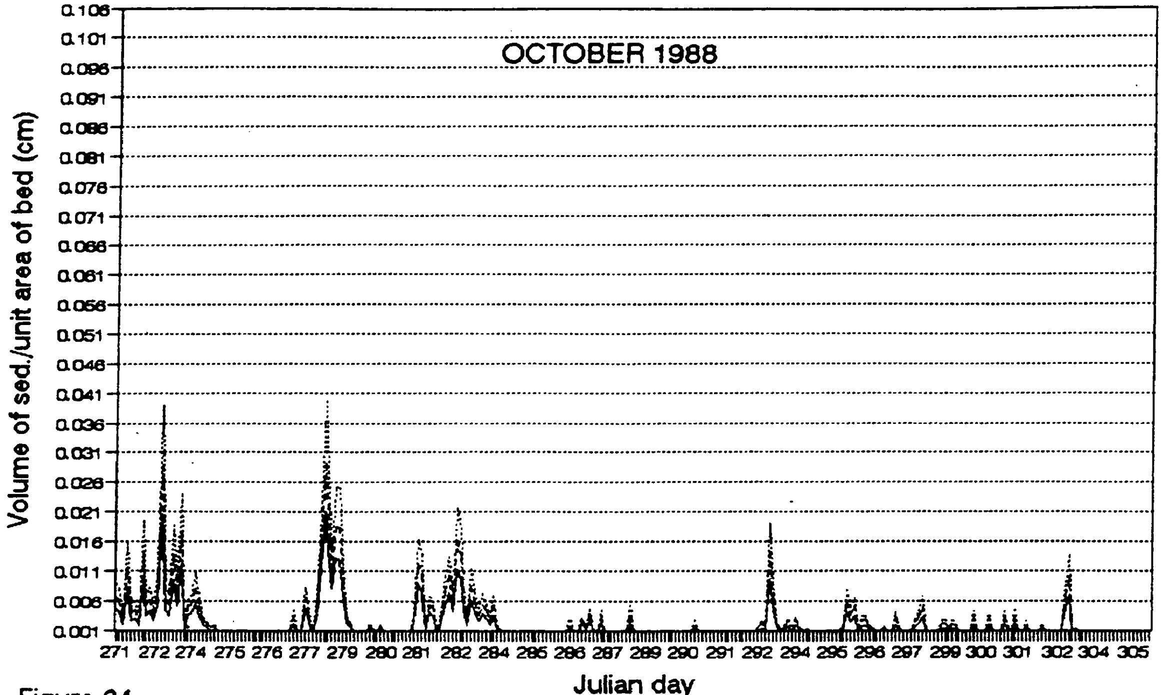


Figure 34

Ds=0.027cm coarse ----- Ds=0.017cm mean ········ Ds=0.011cm fine

TOTAL RESUSPENSION
grain size comparison

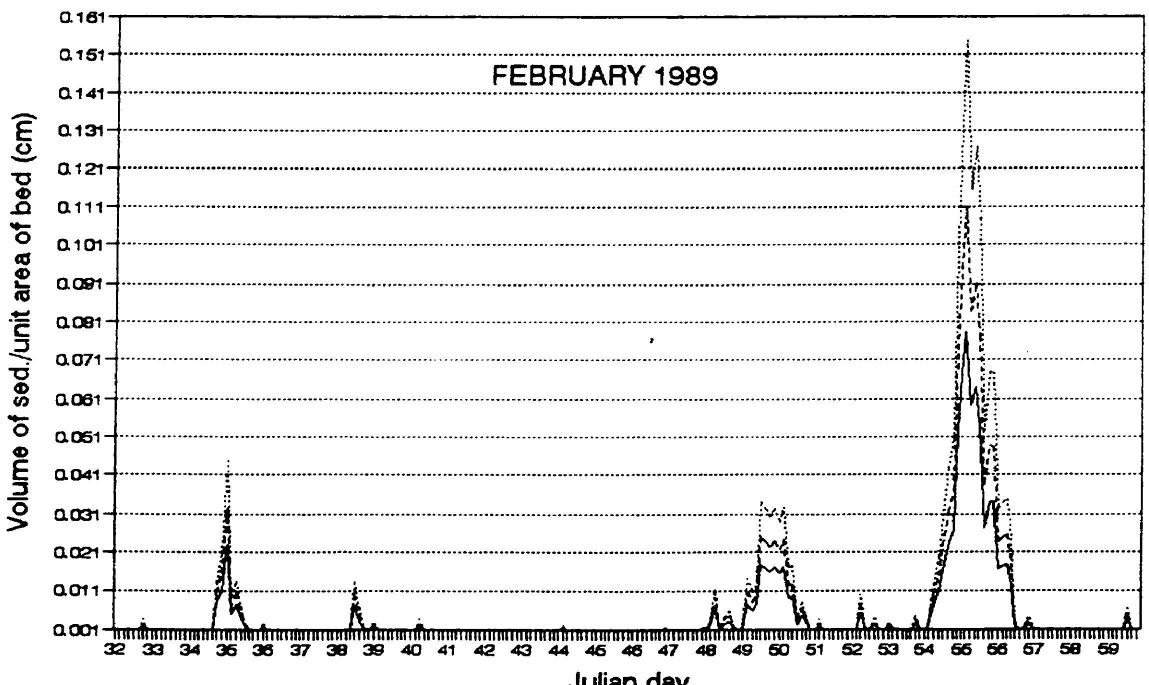


Figure 35

Ds=0.027cm coarse ----- Ds=0.017cm mean ········ Ds=0.011cm fine

TOTAL RESUSPENSION
grain size comparison

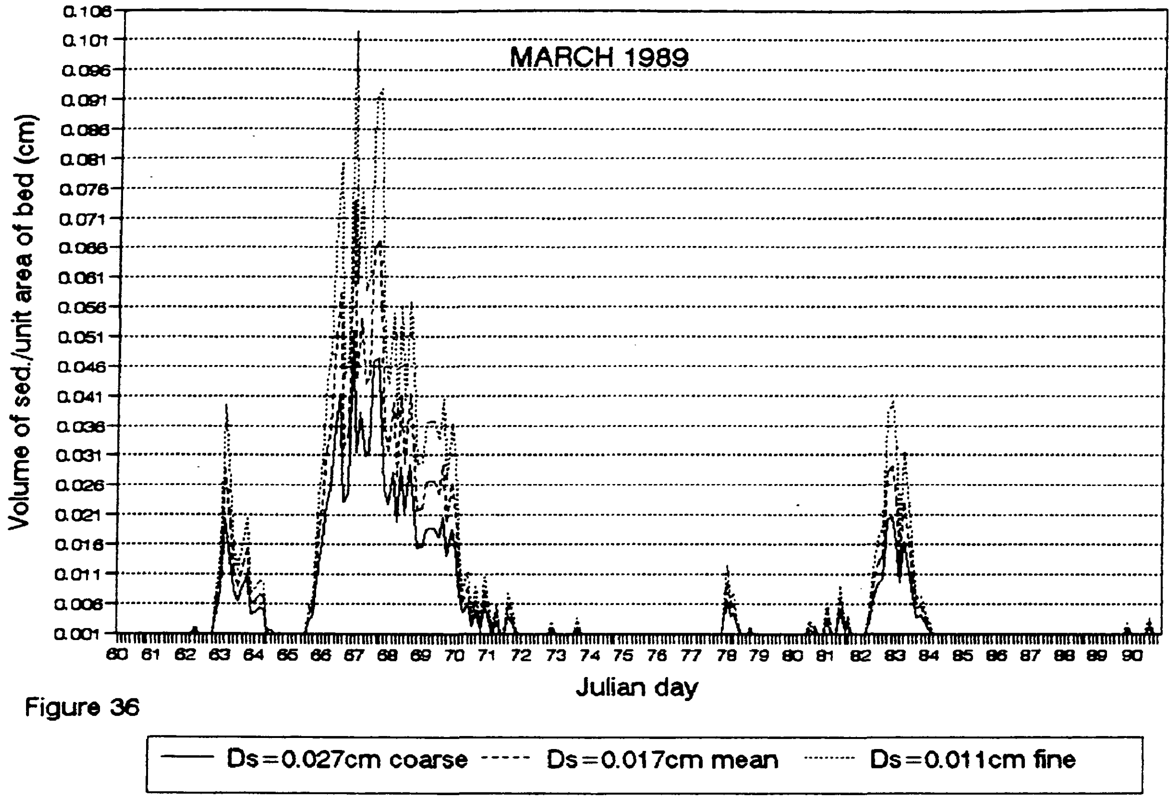


Figure 36

TOTAL RESUSPENSION
grain size comparison

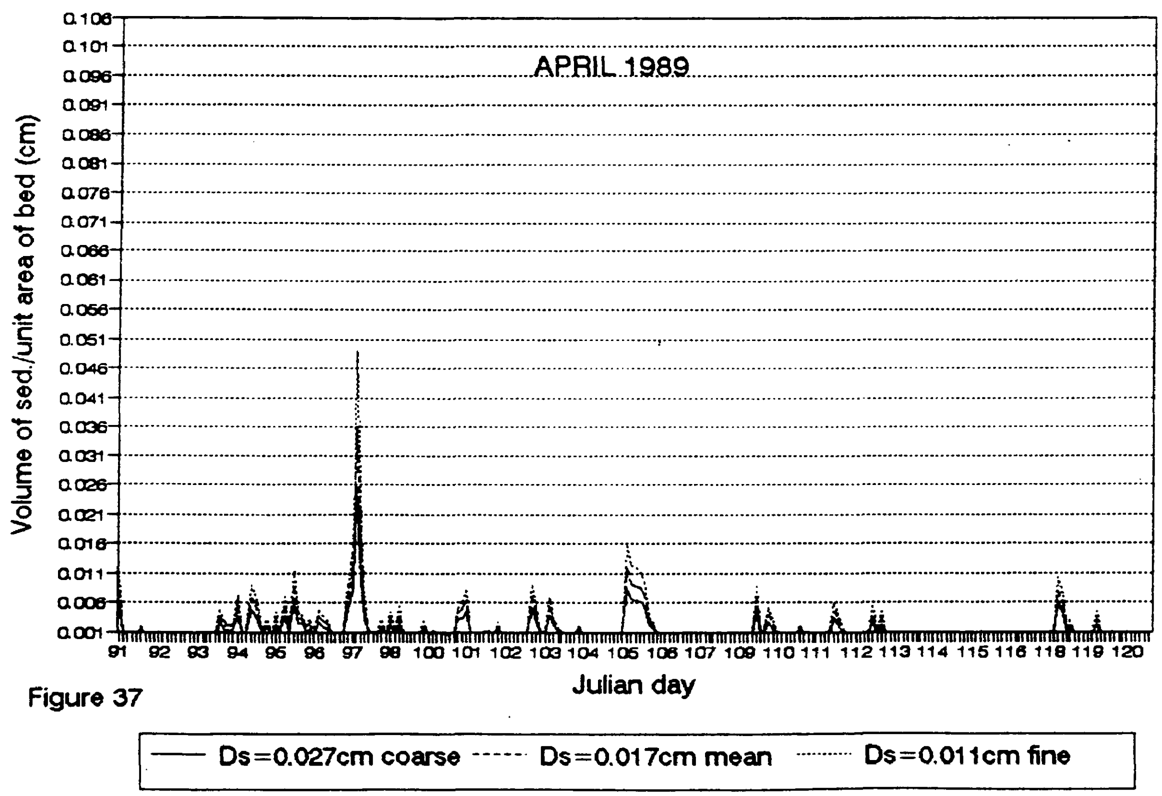


Figure 37

TOTAL RESUSPENSION
grain size comparison

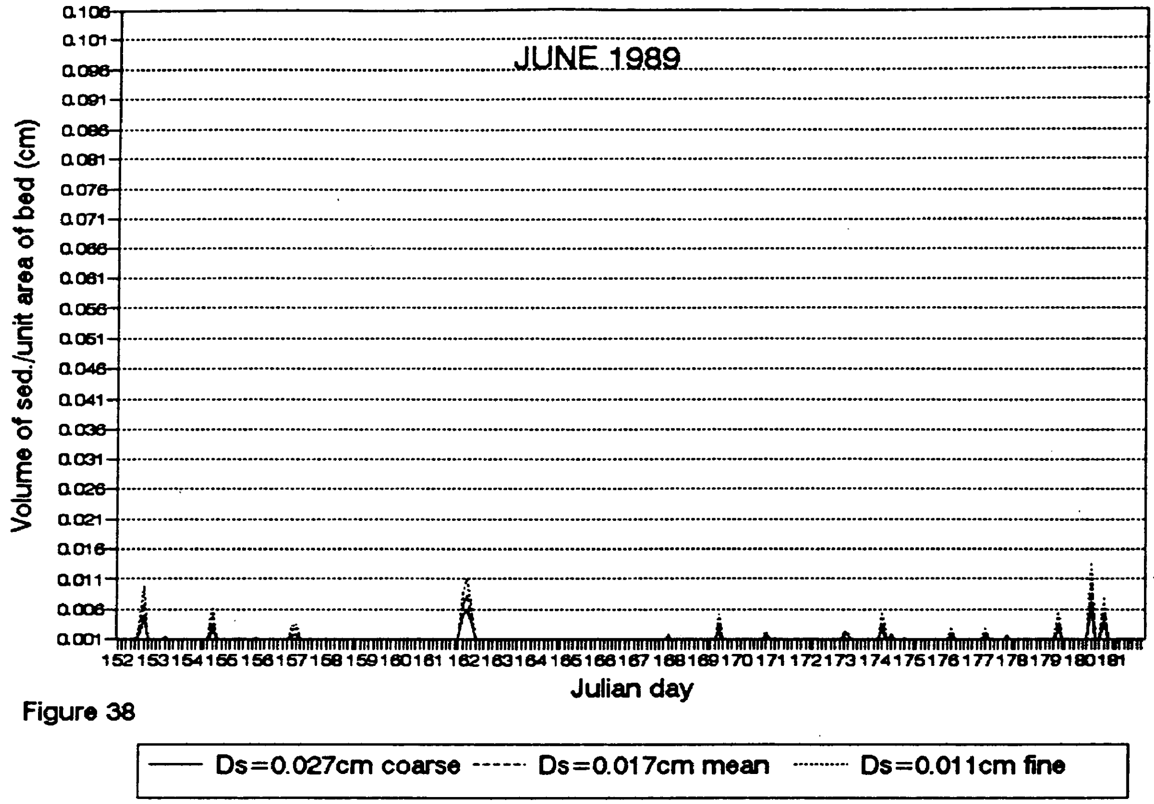


Figure 38

TOTAL RESUSPENSION
grain size comparison

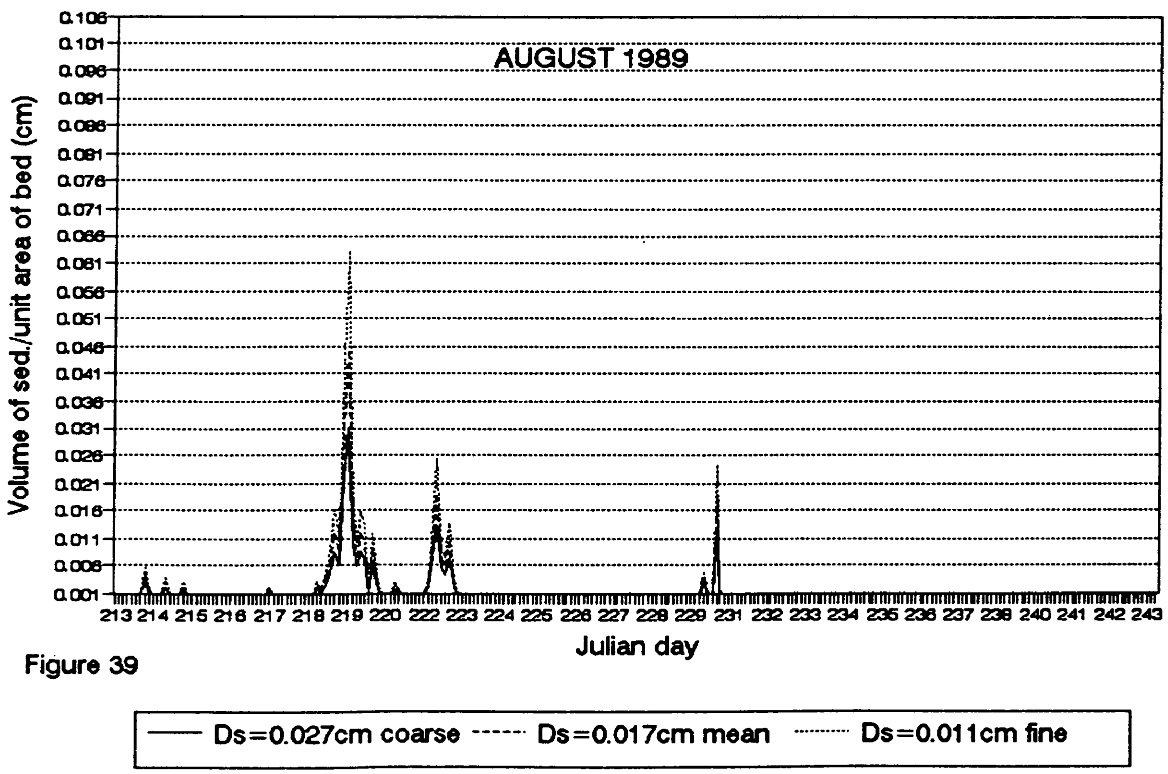


Figure 39

TOTAL RESUSPENSION
grain size comparison

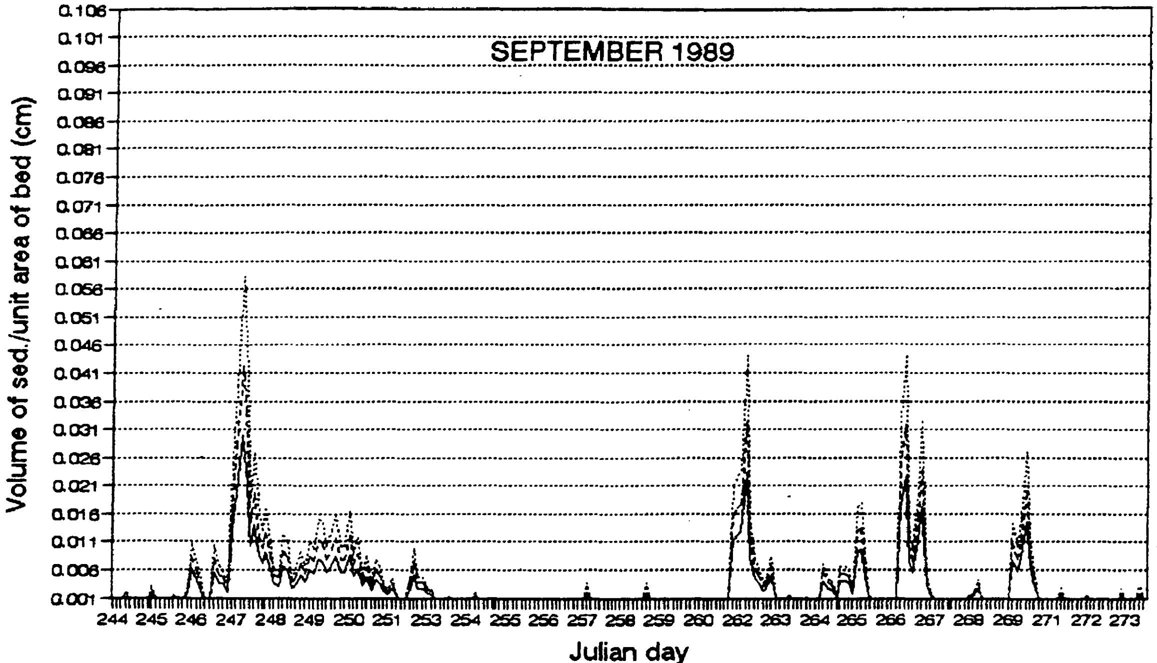


Figure 40

—— Ds=0.027cm coarse ----- Ds=0.017cm mean ······· Ds=0.011cm fine dependent resuspension for the Buckroe reserve sediments. The resuspension is the total amount of sediment mobilized per unit area of bed for all waves regardless of direction or frequency. It is shown for the three characteristic grain sizes of Buckroe reserve samples (coarse, mean, and fine) for seven months (OCT88, FEB89, MAR89, APR89, JUN89, AUG89 and SEP89) in order to demonstrate differences in the predicted resuspension of different grain sizes of sediments under varying energy conditions. Table 8 summarizes the differences in terms of frequency and cumulative resuspension (net effect of both frequency and magnitude) for each grain size.

Figures 41 -43 contain time series of the predicted sediment size-dependent resuspension for the TSC reserve sediments. Resuspension again is the total amount of sediment mobilized per unit area of bed for all waves regardless of direction or frequency, and is shown for the coarse, mean, and fine grain sizes of the TSC reserve sediments. Three months were chosen to model resuspension (MAR89, JUN89, and SEP89), so that relative differences in predicted resuspension between the TSC distribution and the Buckroe distribution could be demonstrated under varying energy conditions. Table 9 summarizes the predicted resuspension of TSC grain sizes in terms of frequency and cumulative resuspension for each grain size.

For the Buckroe reserve grain size distributions, during all months the frequency of the predicted resuspension of the coarse grain size was just slightly less than that for the mean or fine grain size. The frequency of predicted resuspension of the fine grain size typically did not differ much from that for the mean grain size. For OCT88, FEB89, MAR89, JUN89, and AUG89, frequencies of predicted resuspension of mean and fine grain sizes were equal. The predicted cumulative resuspension for all 7 months was lowest for the coarse grain size, intermediate for the

Table 8. Frequency and cumulative volume of sediment mobilized per unit area of bed, for the Buckroe reserve sediment samples.

MONTH	Frequency	Cumulative resuspension (cm /cm)	Grain sizes (cm)
OCT 1988	0.36	0.424	0.027 coarse
	0.40	0.623	0.017 mean
	0.40	0.810	0.011 fine
FEB 1989	0.28	0.885	0.027 coarse
	0.30	1.255	0.017 mean
	0.30	1.709	0.011 fine
MAR 1989	0.36	1.230	0.027 coarse
	0.39	1.742	0.017 mean
	0.39	2.363	0.011 fine
APR 1989	0.25	0.213	0.027 coarse
	0.30	0.324	0.017 mean
	0.29	0.414	0.011 fine
JUN 1989	0.08	0.054	0.027 coarse
	0.12	0.089	0.017 mean
	0.12	0.114	0.011 fine
AUG 1989	0.13	0.192	0.027 coarse
	0.15	0.277	0.017 mean
	0.15	0.367	0.011 fine
SEP 1989	0.42	0.612	0.027 coarse
	0.46	0.868	0.017 mean
	0.45	1.131	0.011 fine

Table 9. Frequency and cumulative volume of sediment mobilized per unit area of bed, for the TSC reserve sediment samples

MONTH	Frequency	Cumulative resuspension (cm /cm)	Grain sizes (cm)
MAR 1989	0.29	0.631	0.060 coarse
	0.36	1.195	0.028 mean
	0.40	2.127	0.013 fine
JUN 1989	0.03	0.014	0.060 coarse
	0.08	0.052	0.028 mean
	0.14	0.116	0.013 fine
SEP 1989	0.29	0.273	0.060 coarse
	0.42	0.594	0.028 mean
	0.47	1.052	0.013 fine

Figures 41-43. Time series of sediment size-dependent predicted resuspension for coarse, mean, and fine grain sizes of TSC reserve sediments. For MAR89, JUN89, and SEP89.

Thimble Shoals Channel Resuspension
grain size comparison

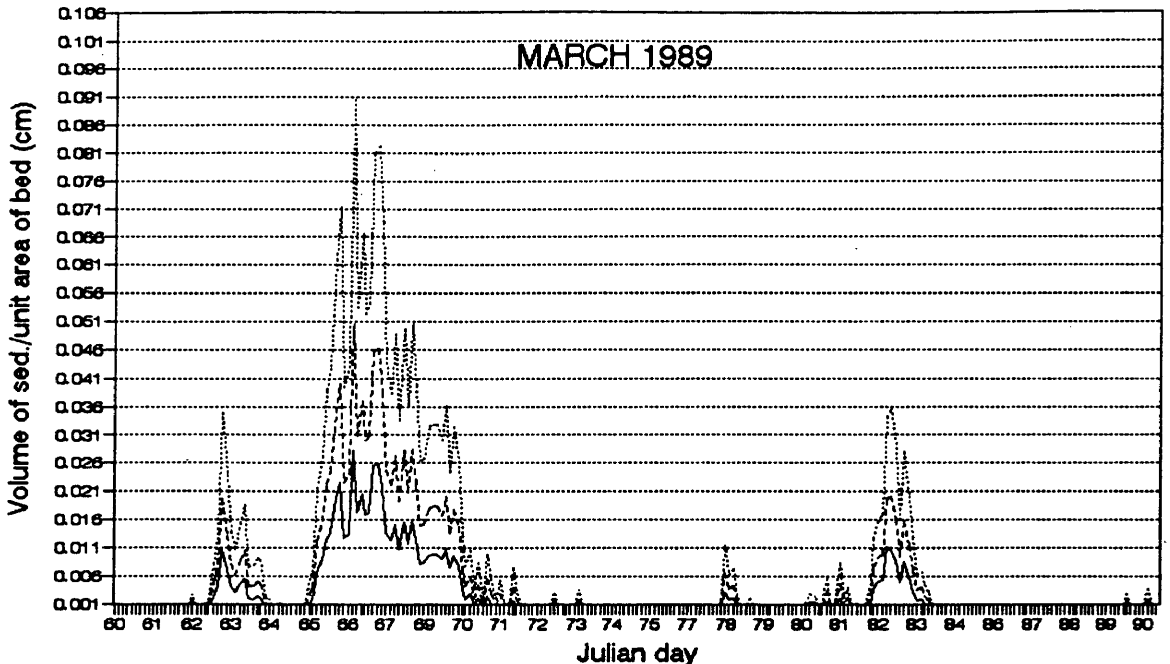


Figure 41

— Ds=0.060cm coarse	------ Ds=0.028cm mean	········ Ds=0.013cm fine

Thimble Shoals Channel Resuspension
grain size comparison

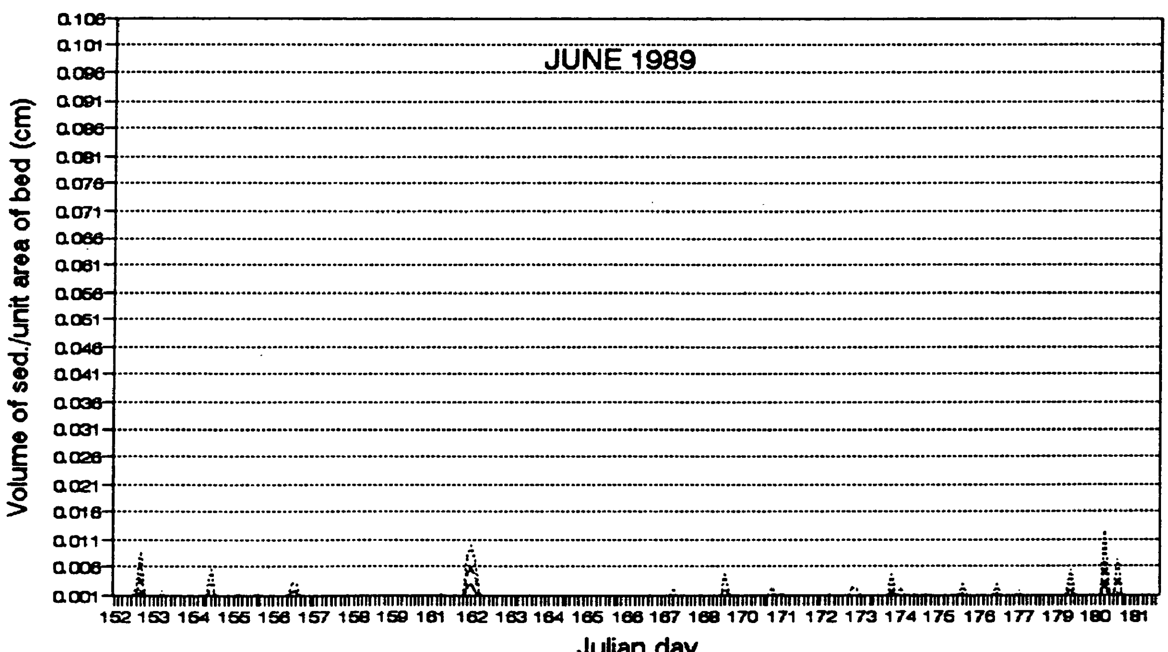
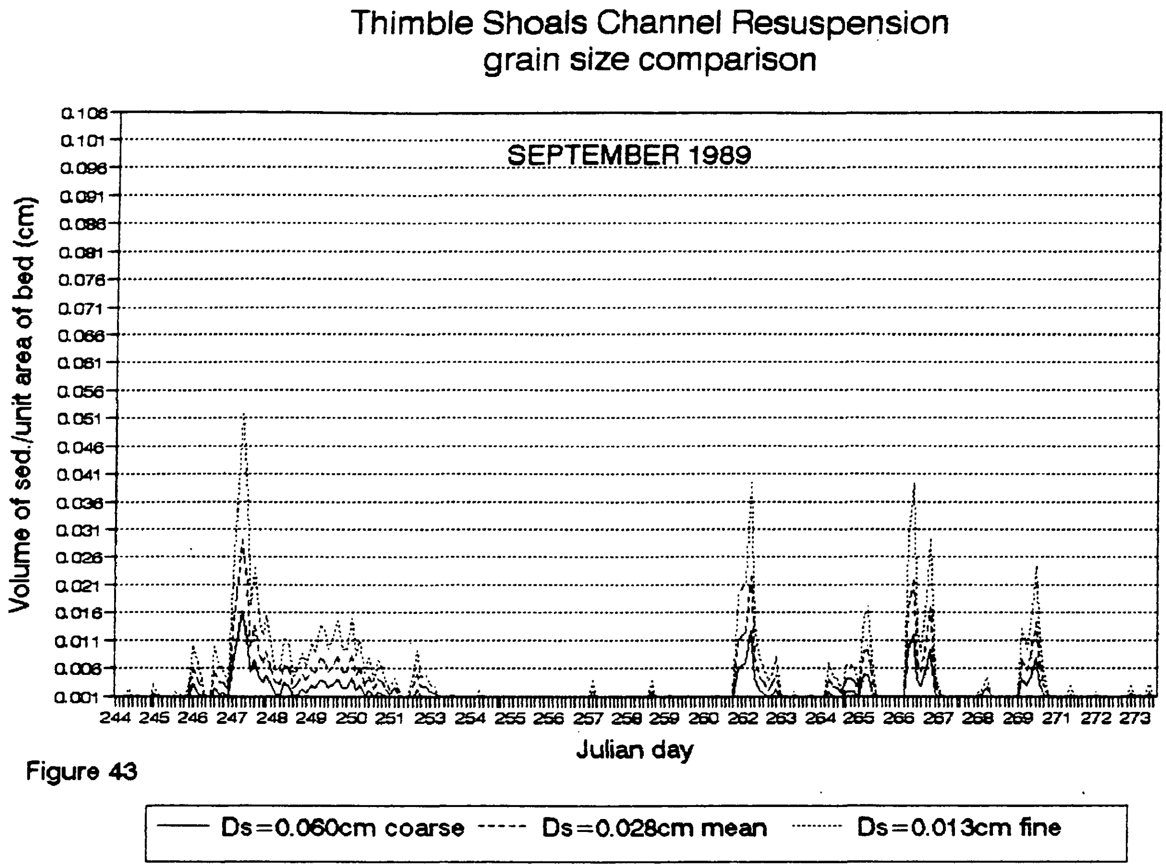


Figure 42

— Ds=0.060cm coarse	------ Ds=0.028cm mean	········ Ds=0.013cm fine



Thimble Shoals Channel Resuspension
grain size comparison
SEPTEMBER 1989
Volume of sed./unit area of bed (cm)
0.106
0.101
0.096
0.091
0.086
0.081
0.076
0.071
0.066
0.061
0.056
0.051
0.046
0.041
0.036
0.031
0.026
0.021
0.016
0.011
0.006
0.001
244 245 246 247 248 249 250 251 253 254 255 256 257 258 259 260 262 263 264 265 266 267 268 269 271 272 273
Julian day
Ds=0.060cm coarse
Ds=0.028cm mean
Ds=0.013cm fine

Figure 43

mean grain size, and highest for the fine grain size. Thus, though the frequency of resuspension did not differ much between grain sizes (i.e., the number of bursts during which any resuspension was predicted vs. the total number of bursts per month), when resuspension was predicted during any one burst, the greatest predicted amounts of sediment mobilized per burst were of the fine grain size, and the smallest predicted amounts of sediment mobilized per burst were of the coarse grain size. This resuspension difference per burst is well illustrated by Figures 34-40 and by Table 8.

For the TSC reserve grain size distributions, frequency of the predicted resuspension of the coarse grain size was less that for the mean grain size which was less than that for the fine grain size. Because the TSC distribution is broader than the Buckroe distribution, differences between frequencies of resuspension for the TSC grain sizes were larger than those for Buckroe grain sizes. The predicted cumulative resuspension for all 3 months was lowest for the coarse grain size, intermediate for the mean grain size, and highest for the fine grain size. Differences in the predicted cumulative resuspension between grain sizes were also larger for the TSC grain sizes than those for the Buckroe reserve grain sizes. Values for the predicted cumulative resuspension of TSC reserve sediments were overall less than those for the Buckroe reserve sediments due to the coarser grain size distribution at TSC.

<u>Predicted resuspension associated with the isolated wave energy components</u>

Figures 44-56 contain time series of the portions of the total predicted resuspension (including both wave energy components) which were associated with the sea wave and bay wave energy components described earlier (resuspension is predicted using equation 18). The isolated resuspension is the amount of sediment mobilized per unit area of bed for the mean sediment grain size and associated with one or the other isolated

Figures 44-56. Monthly time series of predicted sediment resuspension associated with the isolated ("sea wave" and "bay wave") energy components, for October, 1988, through October, 1989.

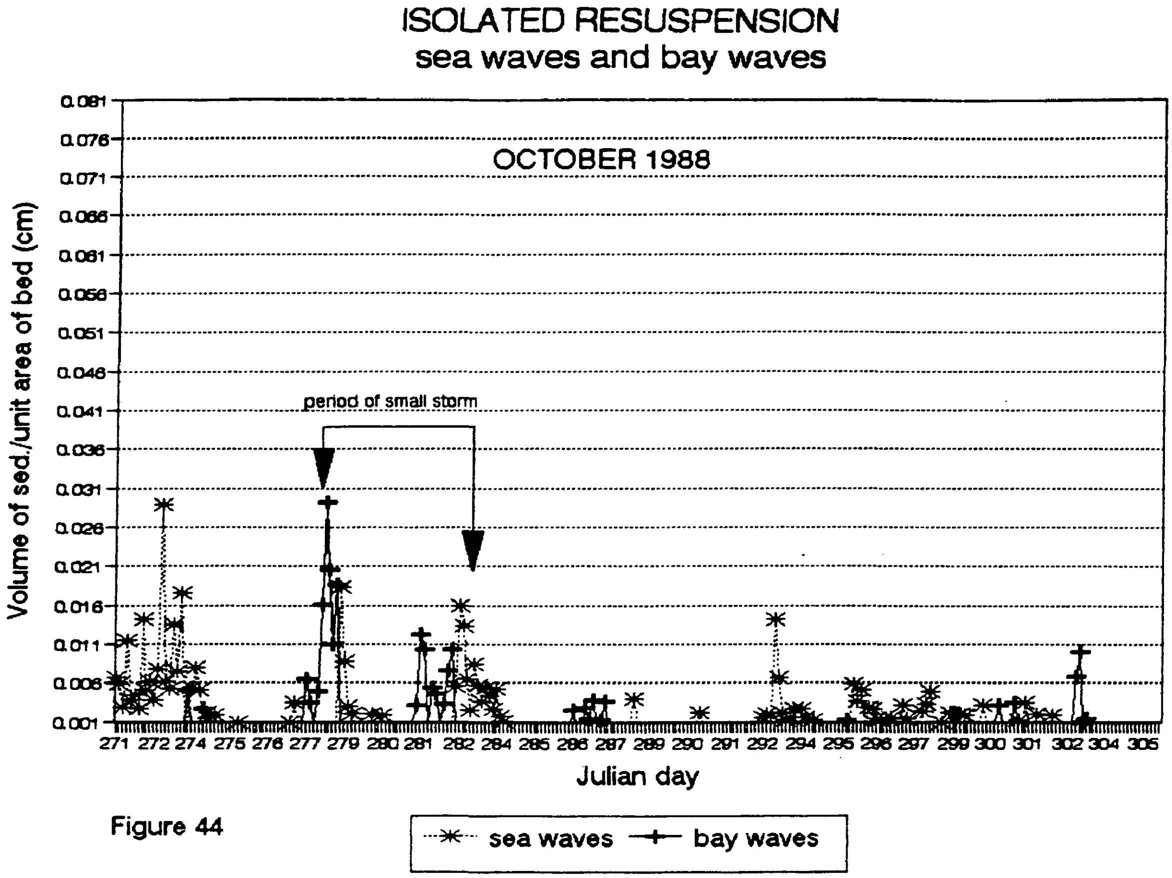


Figure 44

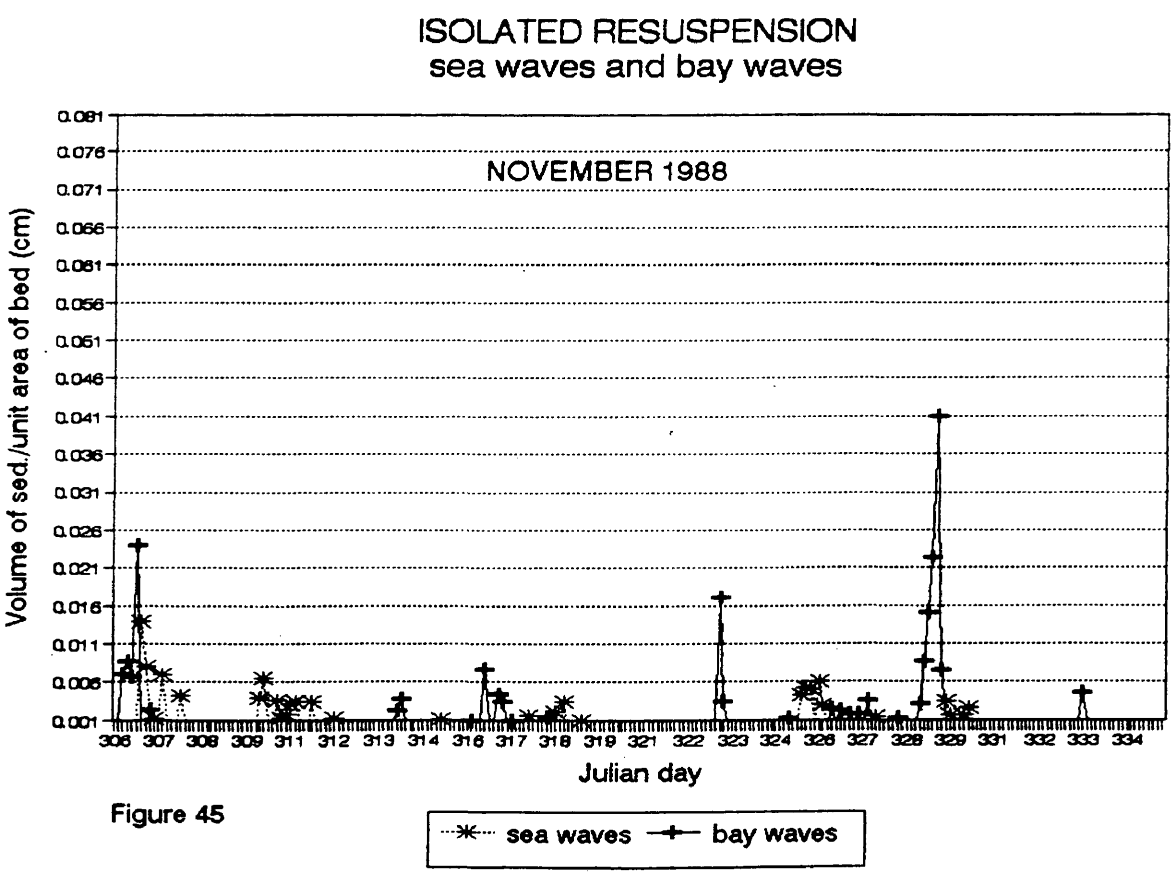


Figure 45

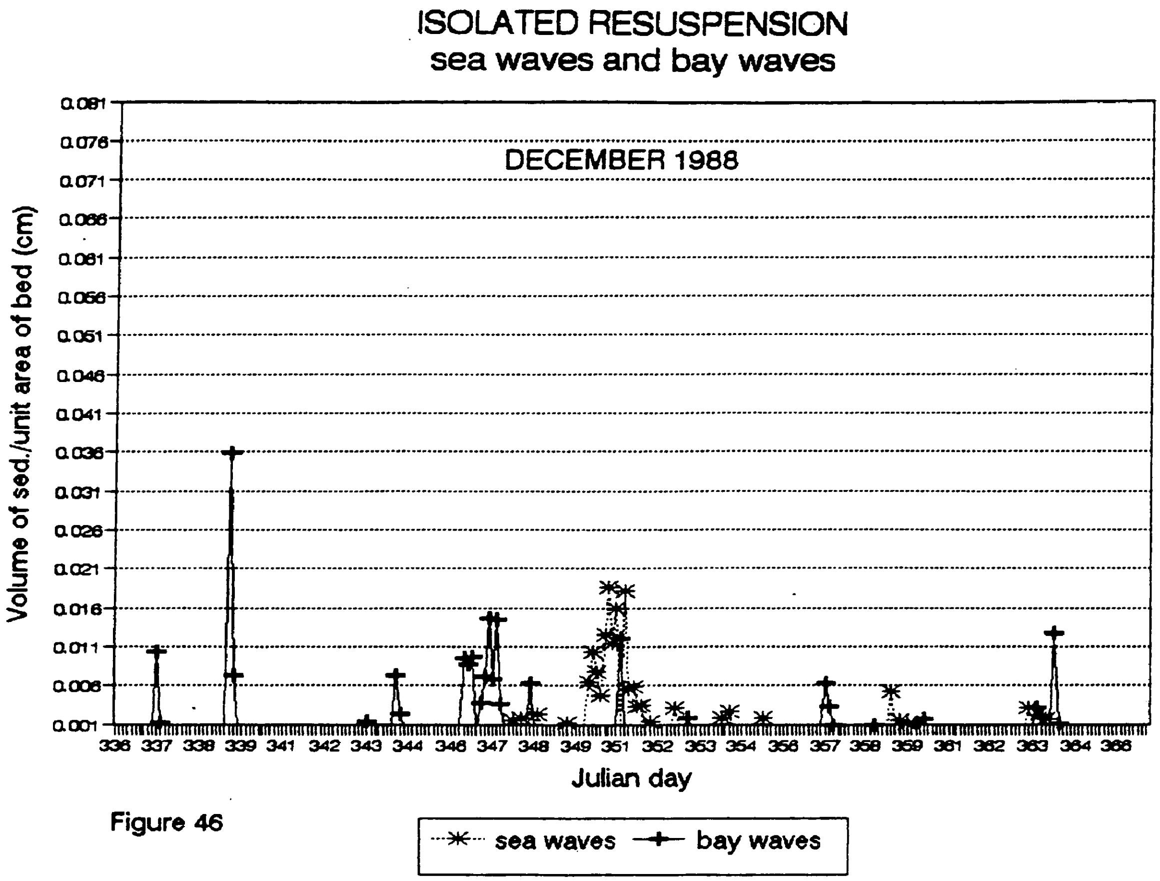


Figure 46

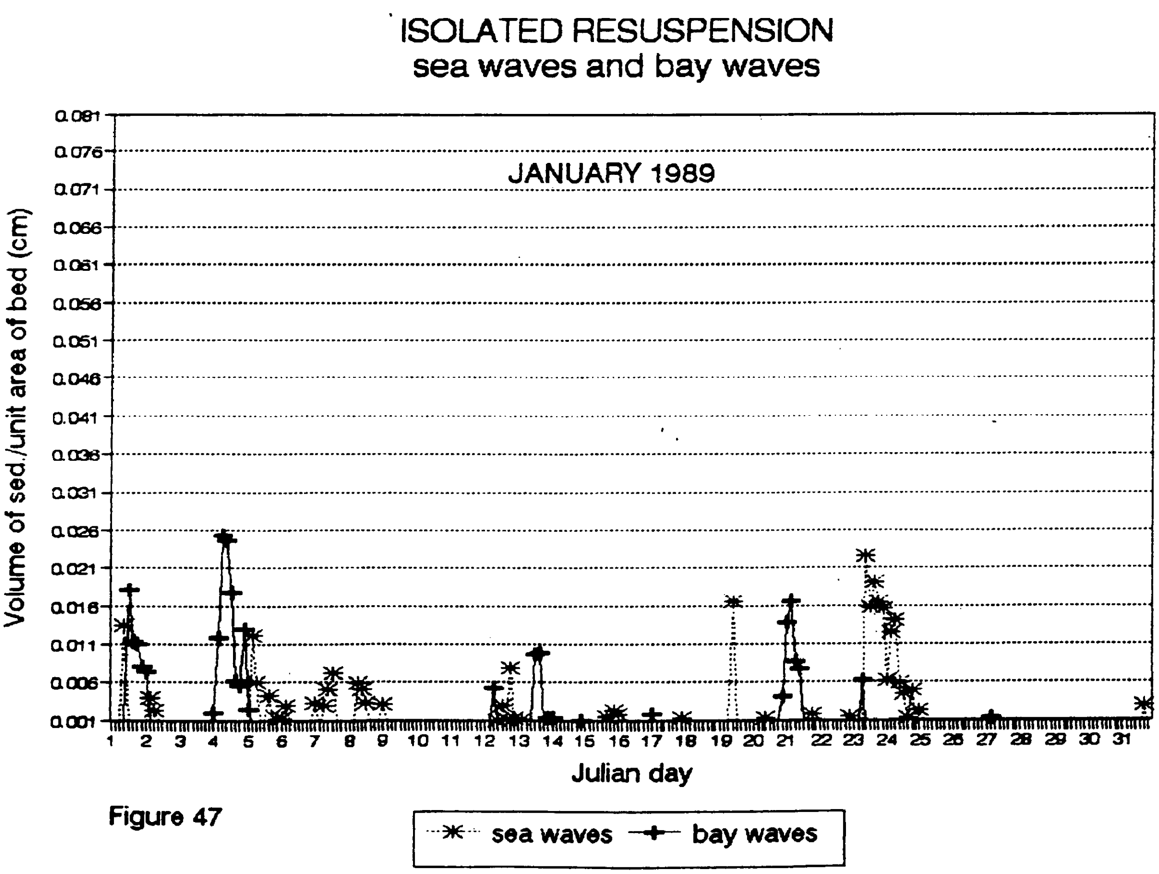


Figure 47

ISOLATED RESUSPENSION
sea waves and bay waves

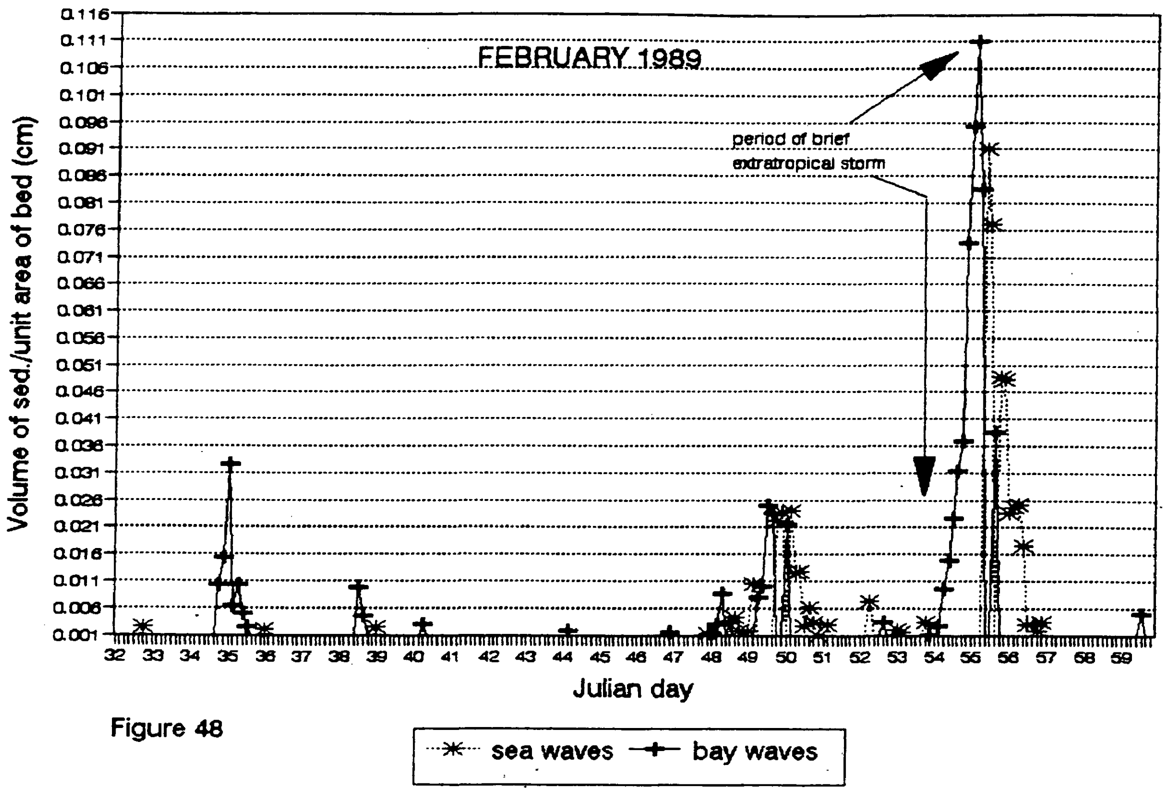


Figure 48

ISOLATED RESUSPENSION
sea waves and bay waves

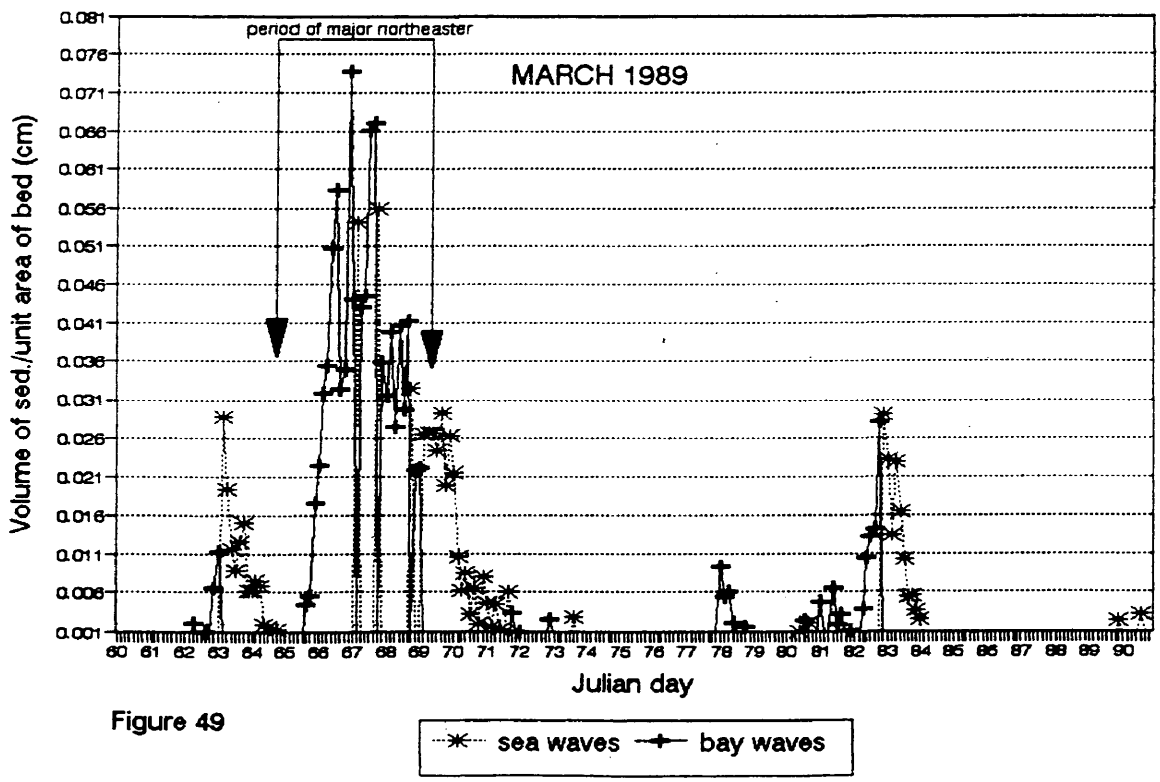


Figure 49

ISOLATED RESUSPENSION
sea waves and bay waves

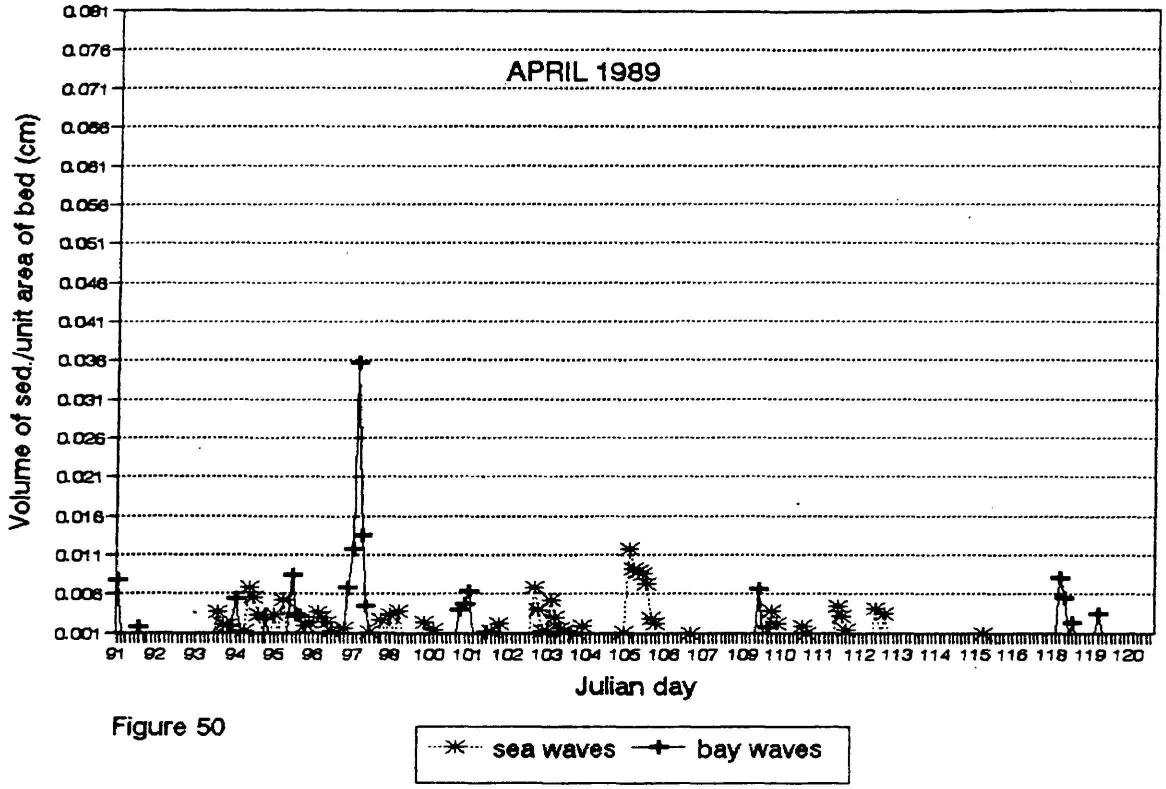


Figure 50

ISOLATED RESUSPENSION
sea waves and bay waves

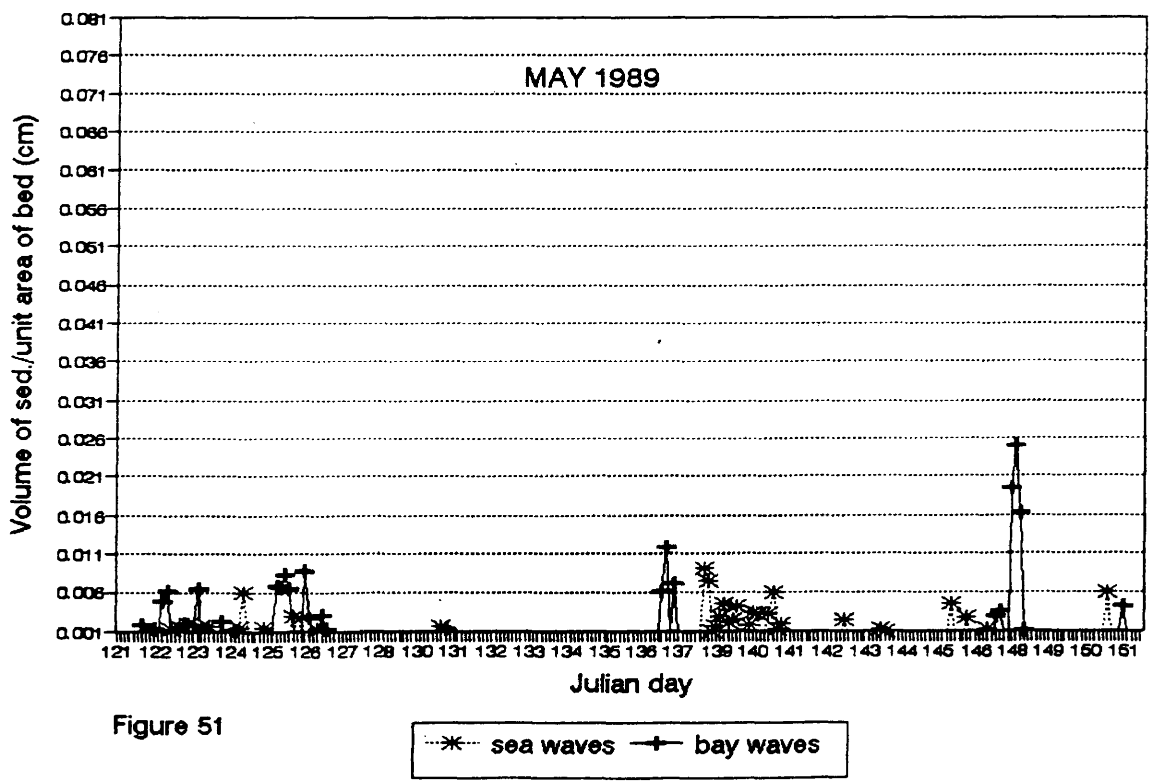


Figure 51

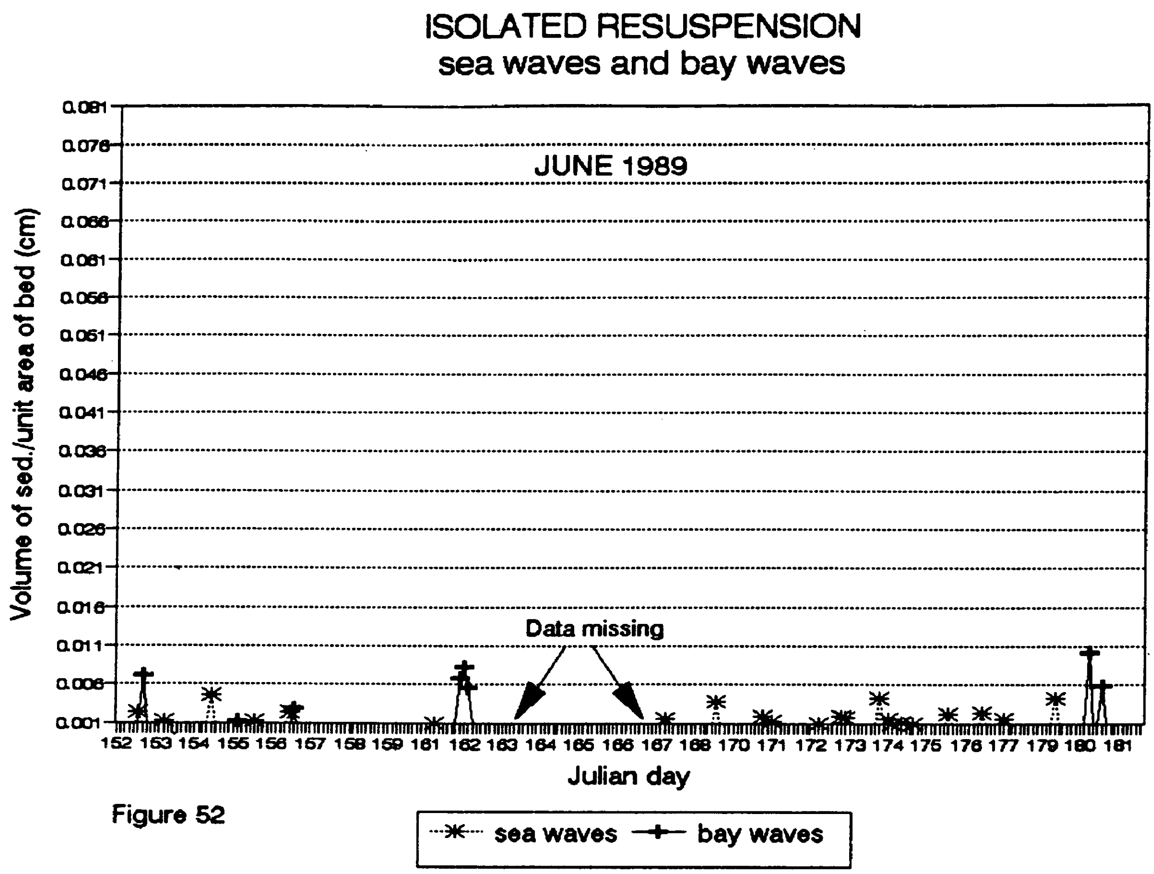


Figure 52

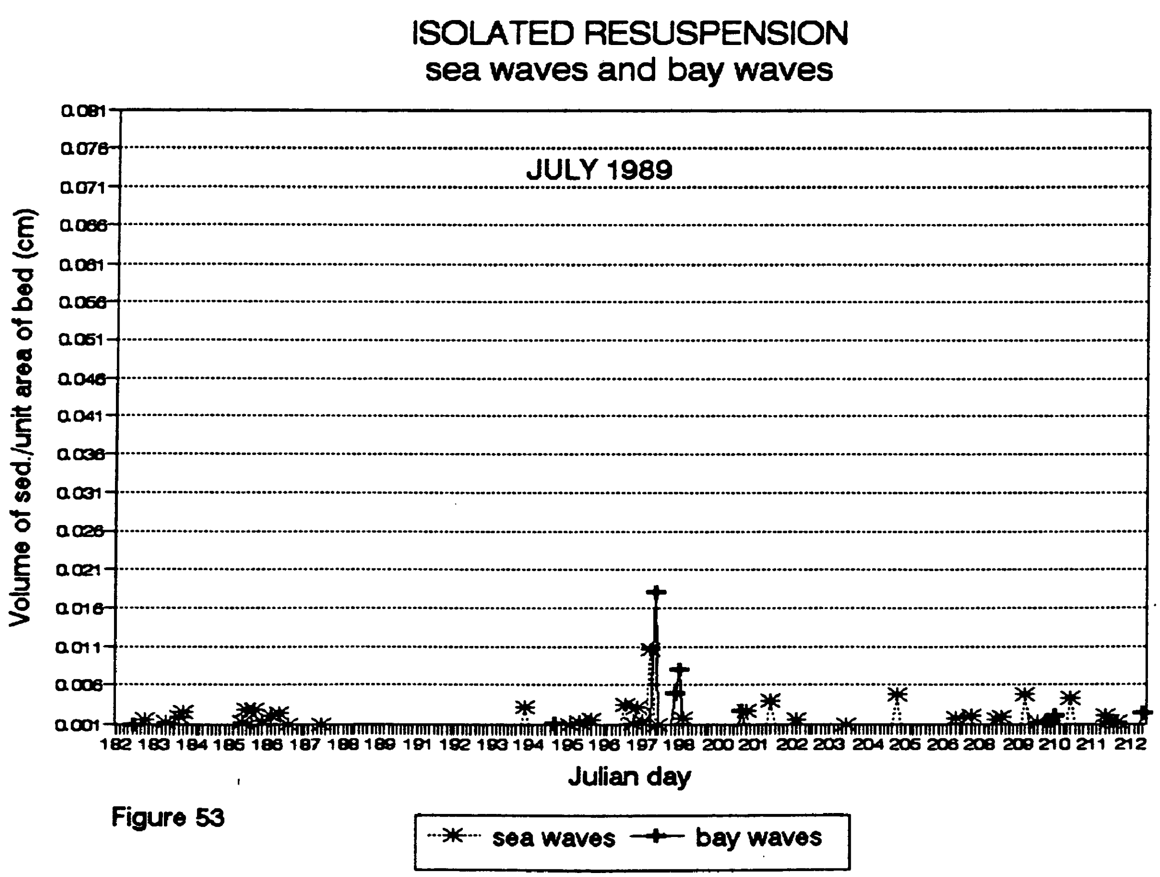


Figure 53

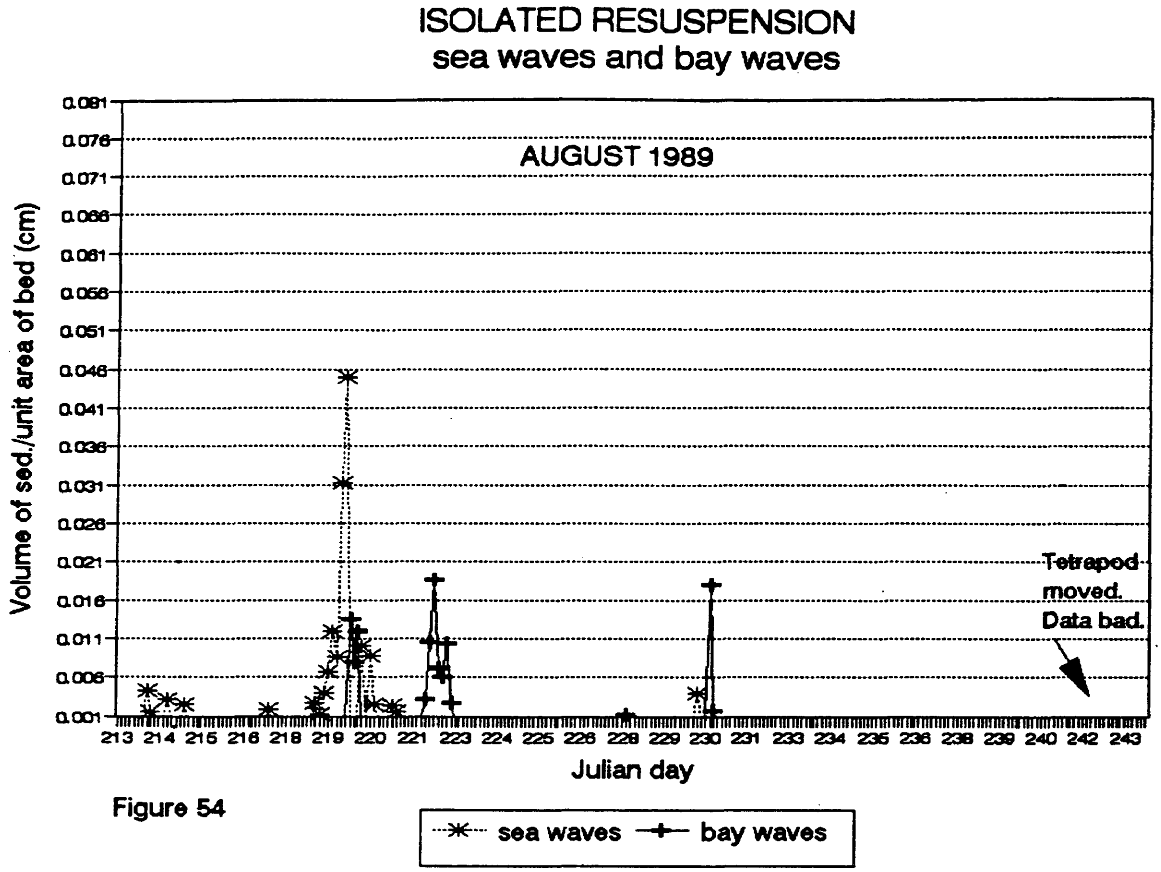


Figure 54

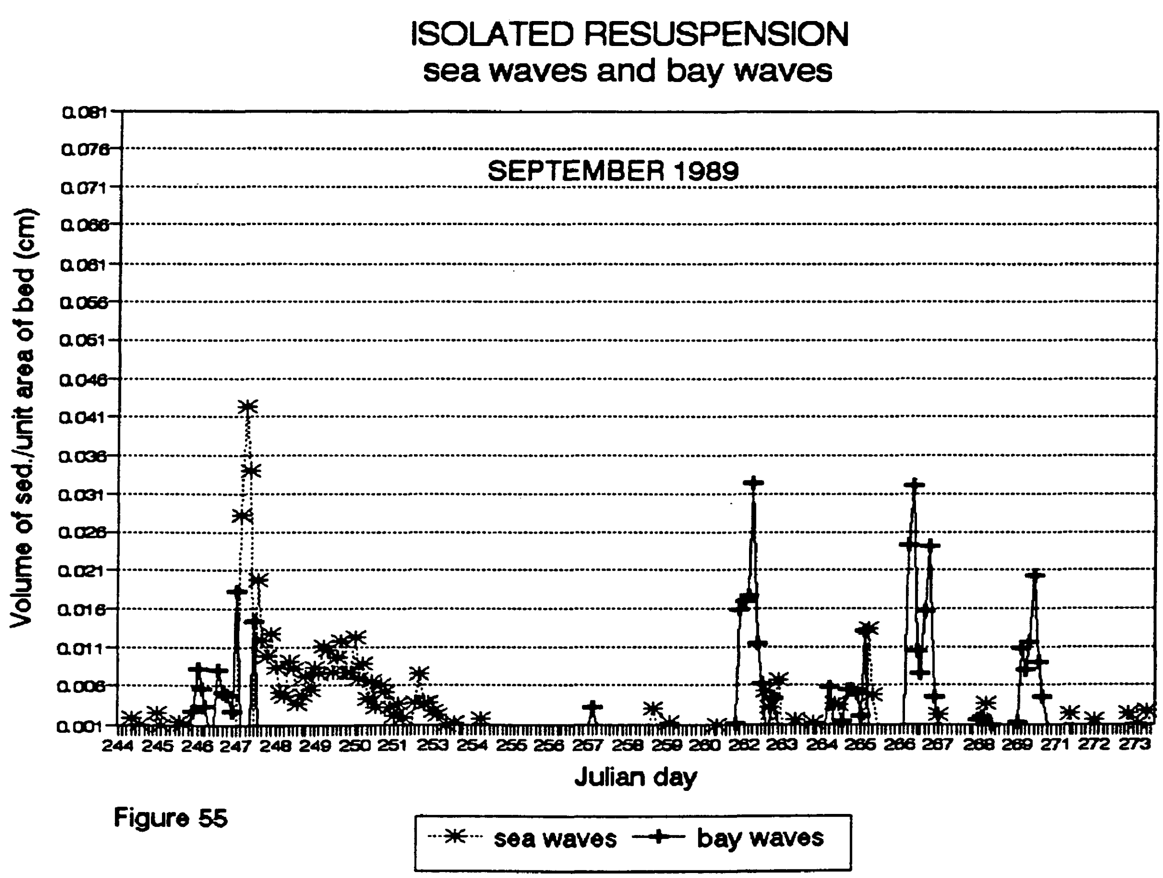
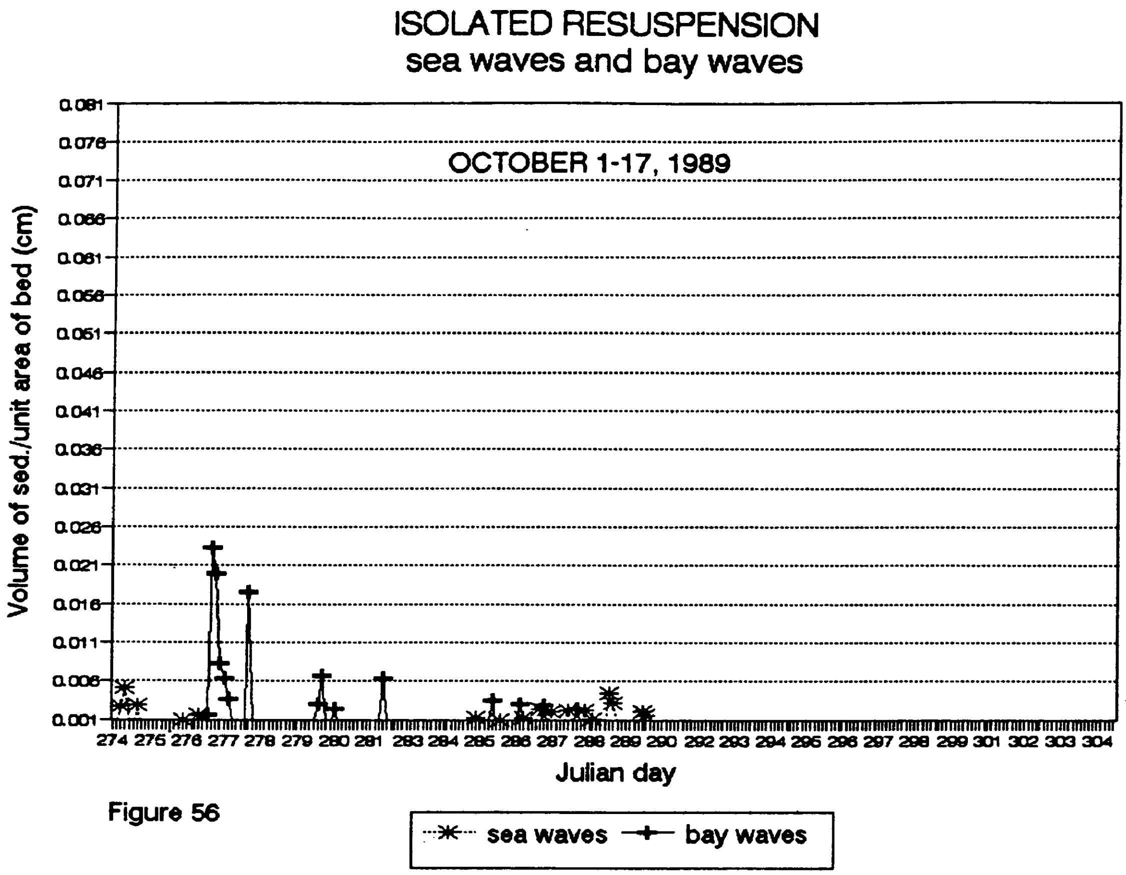


Figure 55



ISOLATED RESUSPENSION
sea waves and bay waves
OCTOBER 1-17, 1989
Volume of sed./unit area of bed (cm)
Julian day
sea waves
bay waves

Figure 56

wave energy components. The figures provide a visual representation of relative differences in frequencies and magnitudes of predicted resuspension for each wave energy component. Tables 10a and 10b summarize the predicted sediment resuspension associated with each component in terms of frequency and magnitude for each month. Frequency is calculated as the number of bursts during which predicted resuspension was associated with a particular component divided by the total number of bursts for the month. Thus, addition of the first two columns in Table 10a equals the frequency of total predicted resuspension (including both wave energy components) given in Table 7a. Frequency is also shown as the percent of the total predicted resuspension (including both wave components) which is due to each of the individual wave energy component (Table 10b). This is calculated as the number of bursts during which predicted resuspension was associated with a particular component divided by the total number of bursts for which any resuspension events were predicted. Magnitude is given in terms of the monthly mean amount of predicted resuspension due to each component, and the monthly maximum amount of predicted resuspension reached by each component. The predicted cumulative resuspension (Table 10b) is the cumulative amount of sediment predicted to be resuspended for all bursts associated with each individual wave energy component. Again, it represents the net effect of both frequency and magnitude of predicted resuspension for each wave component.

In terms of frequency (Table 10a), sea waves were predicted to resuspend sediment the most frequently in all months with 2 exceptions (FEB89 and DEC88). In FEB89, bay waves were predicted to resuspend sediment slightly more frequently, and in DEC88, bay waves and sea waves were predicted to resuspend sediment at the same frequency. Another way of looking at the frequency of predicted resuspension is in terms of the percent of the total resuspension predicted for each wave energy component (Table 10b). Results here are the same as those just described, however,

Table 10a. Frequency and magnitude of sediment resuspension associated with Sea wave and Bay wave energy components.

Month	Frequency Sea waves	Frequency Bay waves	Mean resuspension Sea waves (cm /cm)	Mean resuspension Bay waves (cm /cm)	Maximum resuspension Sea waves (cm /cm)	Maximum resuspension Bay waves (cm /cm)
OCT88	0.29	0.11	0.005	0.007	0.029	0.029
NOV88	0.12	0.11	0.004	0.008	0.014	0.041
DEC88	0.11	0.11	0.006	0.007	0.019	0.036
JAN89	0.18	0.11	0.006	0.009	0.023	0.025
FEB89	0.14	0.16	0.016	0.021	0.091	0.111
MAR89	0.20	0.19	0.014	0.023	0.056	0.074
APR89	0.20	0.10	0.004	0.007	0.012	0.036
MAY89	0.13	0.11	0.003	0.006	0.009	0.025
JUN89	0.09	0.04	0.002	0.006	0.005	0.010
JUL89	0.13	0.03	0.003	0.005	0.011	0.018
AUG89	0.08	0.05	0.008	0.009	0.045	0.019
SEP89	0.28	0.18	0.007	0.010	0.042	0.032
OCT89	0.11	0.11	0.002	0.007	0.005	0.023

Table 10b. Percents of the total resuspension associated with Sea wave and Bay wave energy components, and Cumulative amounts of sediment resuspension associated with each wave energy component for each month.

Month	Cumulative resuspension Sea waves (cm /cm)	Cumulative resuspension Bay waves (cm /cm)	Percent of total Sea waves	Percent of total Bay waves
OCT88	0.415	0.226	72%	28%
NOV88	0.108	0.213	51%	49%
DEC88	0.160	0.200	50%	50%
JAN89	0.276	0.253	62%	38%
FEB89	0.521	0.741	48%	52%
MAR89	0.682	1.067	52%	48%
APR89	0.181	0.154	68%	32%
MAY89	0.105	0.172	54%	46%
JUN89	0.050	0.049	69%	31%
JUL89	0.093	0.043	80%	20%
AUG89	0.154	0.113	59%	41%
SEP89	0.467	0.408	62%	38%
OCT89	0.041	0.111	50%	50%

relative differences between wave energy components are easier to see. In FEB89, the percent of the total resuspension predicted for bay waves was 52% compared to 48% predicted for sea waves. In DEC88, the percents of the total resuspension predicted for both components were equal (50%). During NOV88, MAR89 and MAY89, the percent resuspension predicted for sea waves was greater than that predicted for bay waves, however, differences between components were small, (differences between 2% - 8%). For all other months, (OCT88, JAN89, APR89, and JUN89-SEP89), the percent resuspension for sea waves was again greater than that for bay waves; however, differences between percents due to the two components were larger. During these months, greater than 60% of the total resuspension was predicted for sea waves, with the greatest percent of the total predicted for sea waves in JUL89 at 80%; the percent of the total resuspension predicted for bay waves was less than 40%, and as little as 20% in JUL89.

The greatest mean amount of resuspension (Table 10a) was predicted for bay waves during all months. Differences in the mean concentrations predicted for each component were small overall, but became larger during the two major local winter storm months (FEB89 and MAR89). The maximum amount of resuspension predicted for each component was greatest for bay waves during almost all months, with 3 exceptions (OCT88, AUG89 and SEP89). In OCT88, the maximum amounts predicted for each component were equal, and in AUG89 and SEP89, the greatest maximum amounts of resuspension were predicted for sea waves. Interesting here is the fact that during AUG89 and SEP89, the predicted maximum amounts of resuspension reached were the second greatest of all the months (the only greater concentrations were predicted during the FEB89 and MAR89 storms). Also, as indicated earlier, the months of AUG and SEP are part of hurricane season in the North Atlantic region. Hurricanes did occur during these months in 1989, (hurricane Dean in AUG and hurricanes Gabrielle and Hugo in SEP). Thus, it makes sense that the predicted resuspension events during these months would be greatest for waves generated external to the bay (the sea wave energy component is dominating). Though the maximum amounts of resuspension predicted for bay waves were greatest during most of the months, often the predicted maximum amounts of resuspension for sea waves were not far below. This is especially important to realize during extreme events such as the FEB89 and MAR89 storms. Large magnitudes of sediment were predicted to be resuspended during these storms by the bay wave energy component. The sea wave energy component; however, was predicted to be only slightly less in the maximum amount of sediment it was predicted to resuspend during the storms.

Table 10b contains the cumulative resuspension for all bursts associated with each wave energy component. These values represent the net effect of both frequency and magnitude of predicted resuspension for each wave component. The predicted cumulative resuspension associated with the sea wave component was greatest for the months of OCT88, JAN89, APR89 and JUL89-SEP89. Interestingly, these 6 months are also the months in which the percent of the total resuspension predicted for sea waves was greater than 60%, while the percent of the total predicted for bay waves was less than 40%. In JUN89, the predicted cumulative resuspension associated with both wave energy components was equal. For all other months, (when the percent of total resuspension predicted for sea waves was either equal to or just slightly greater than that predicted for bay waves - or just slightly less as in FEB89), the predicted cumulative resuspension for the bay wave component was the greatest.

Figures 57-69 contain plots of the frequency of exceedance of various resuspension amounts predicted for each wave energy component. These frequency of exceedance plots are a means of determining the predicted amounts of sediment most frequently resuspended for each wave component.

Figures 57-69. Frequency of exceedance of various amounts of predicted resuspension by each wave energy component, for October, 1988, through October, 1989.

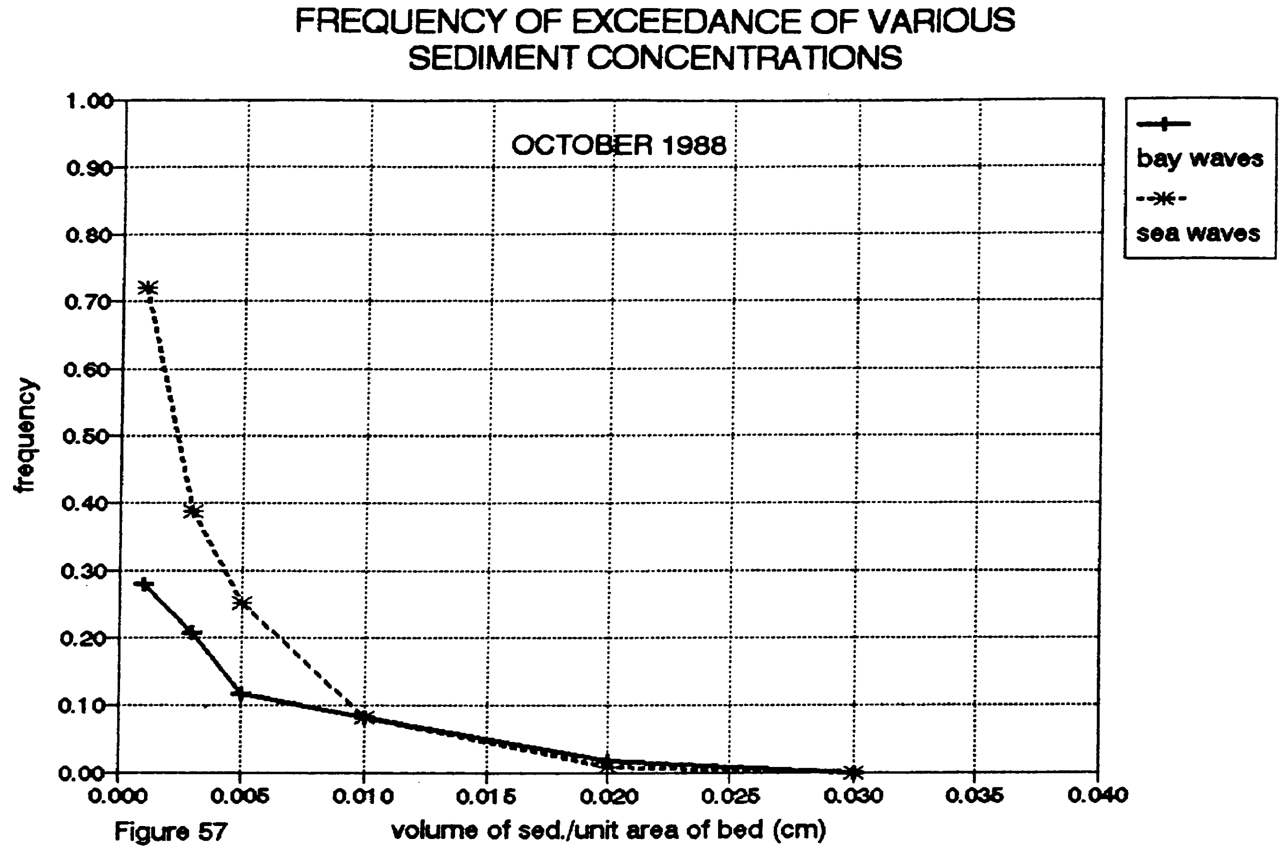


Figure 57

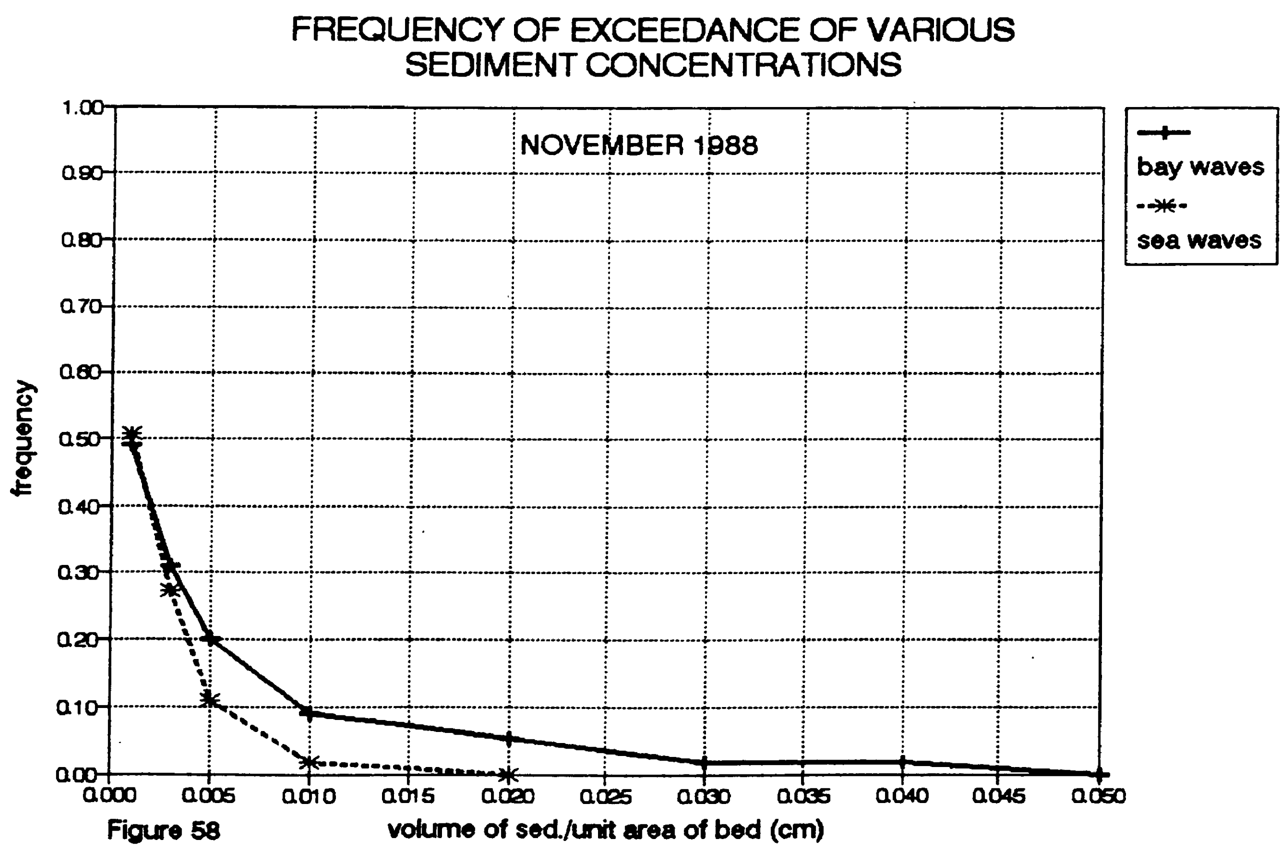


Figure 58

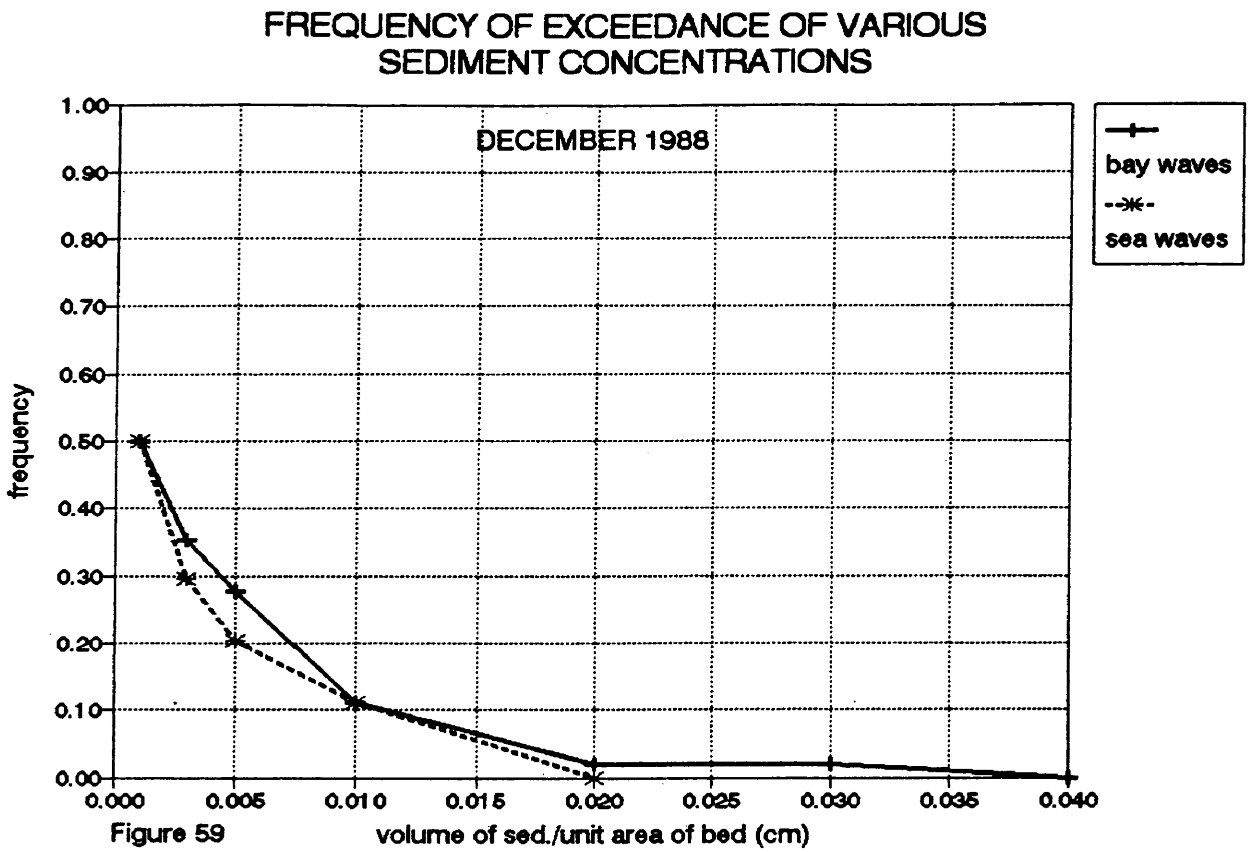


Figure 59

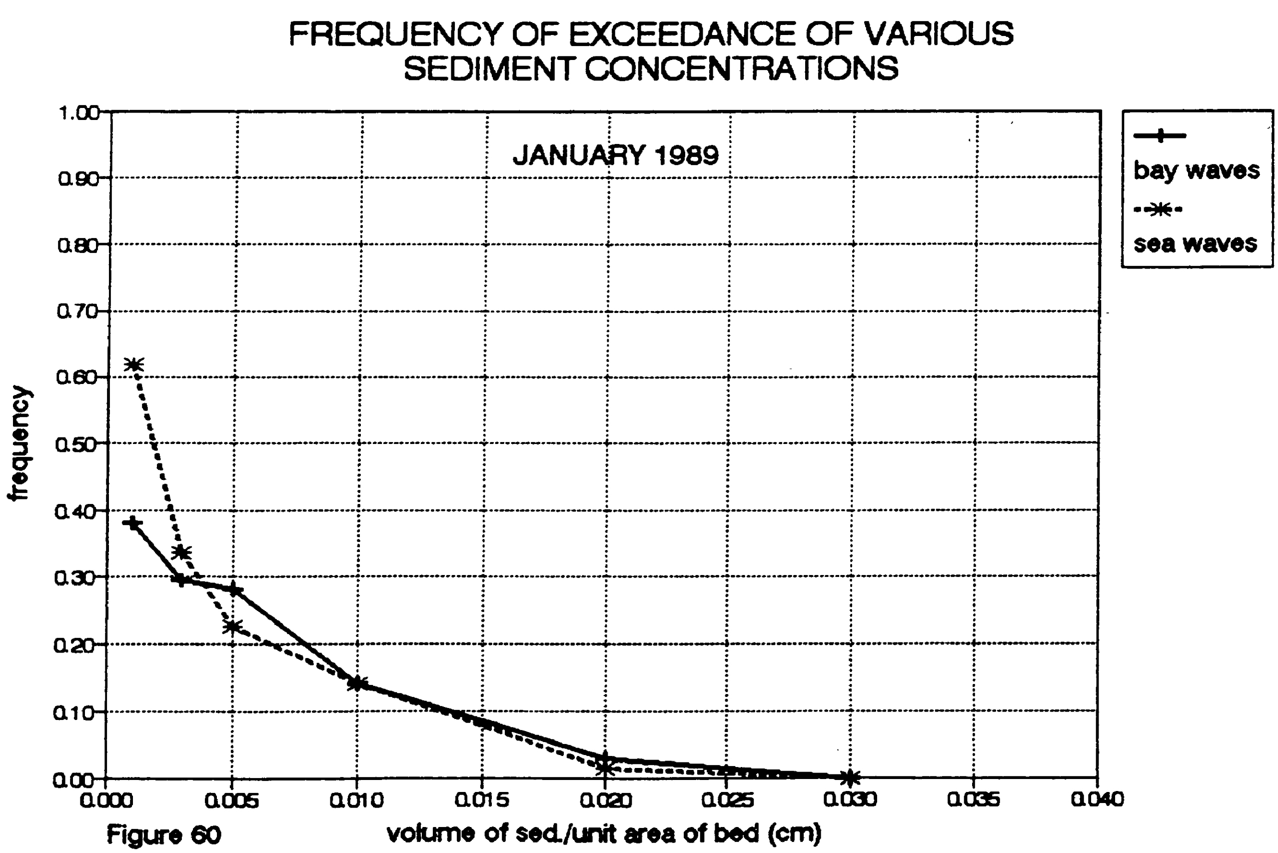


Figure 60

FREQUENCY OF EXCEEDANCE OF VARIOUS SEDIMENT CONCENTRATIONS

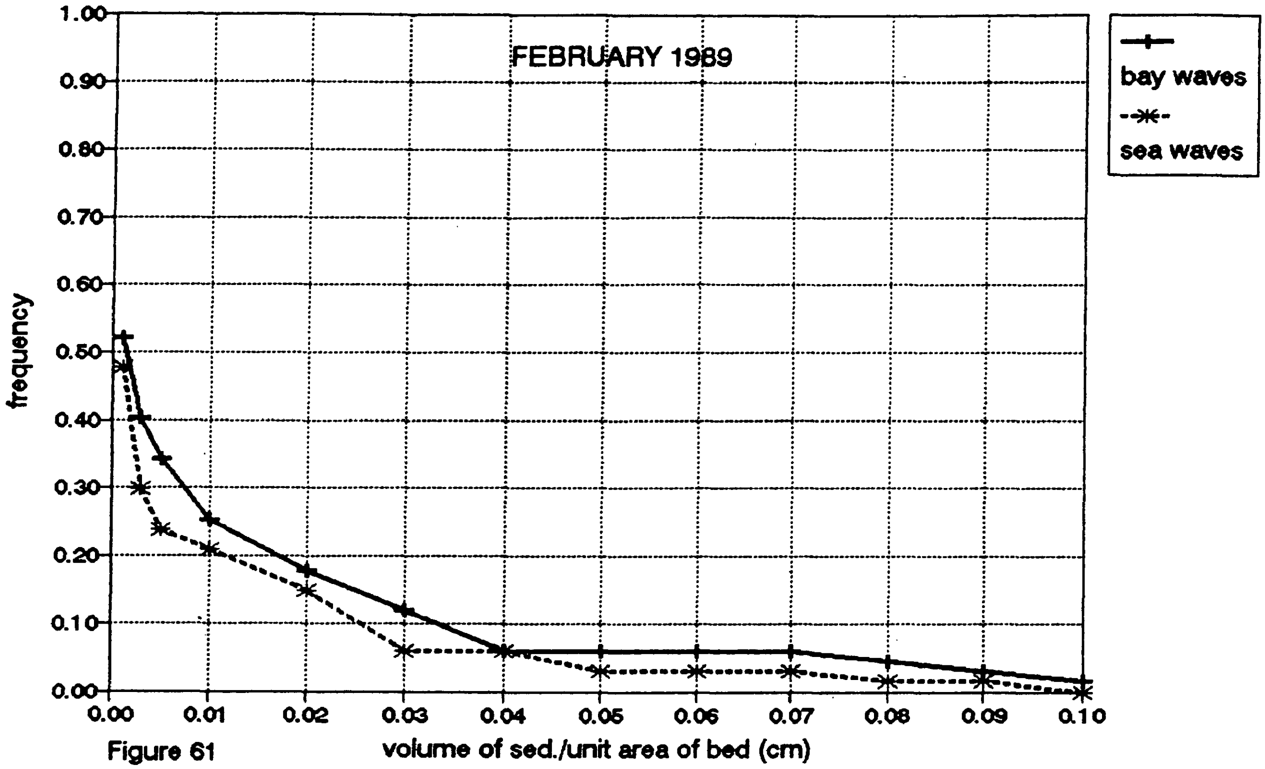


Figure 61

FREQUENCY OF EXCEEDANCE OF VARIOUS SEDIMENT CONCENTRATIONS

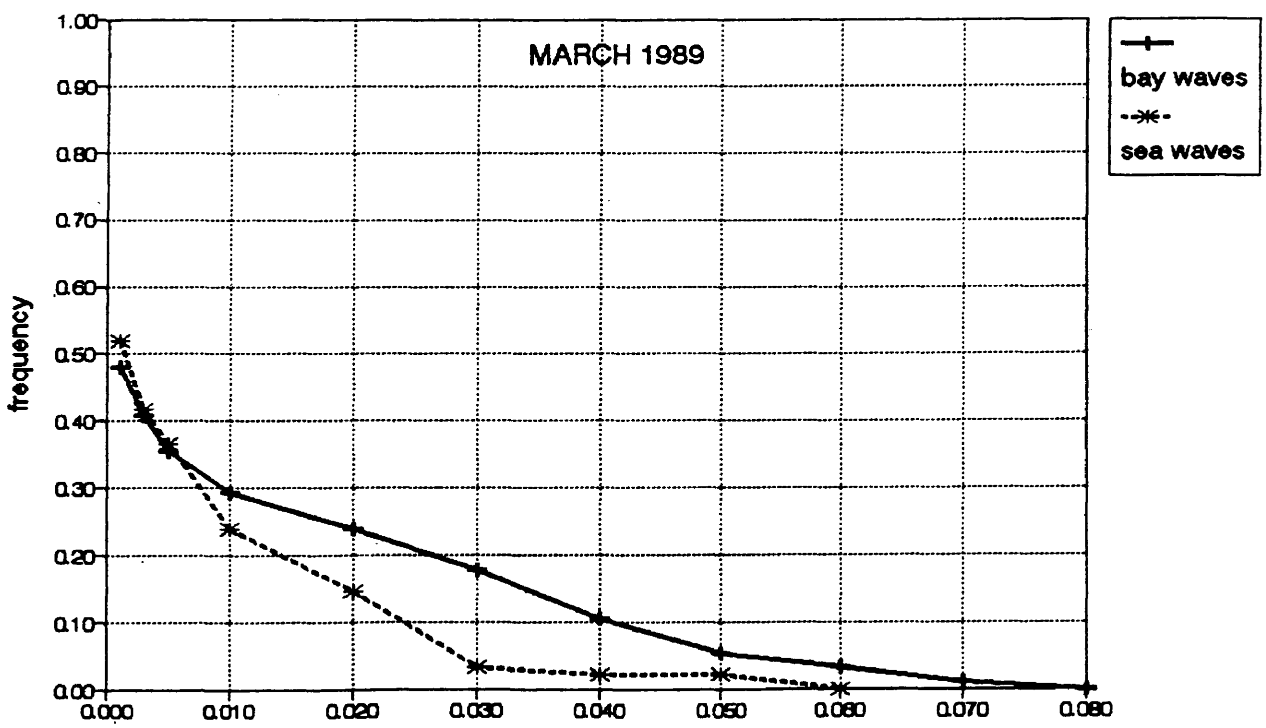


Figure 62

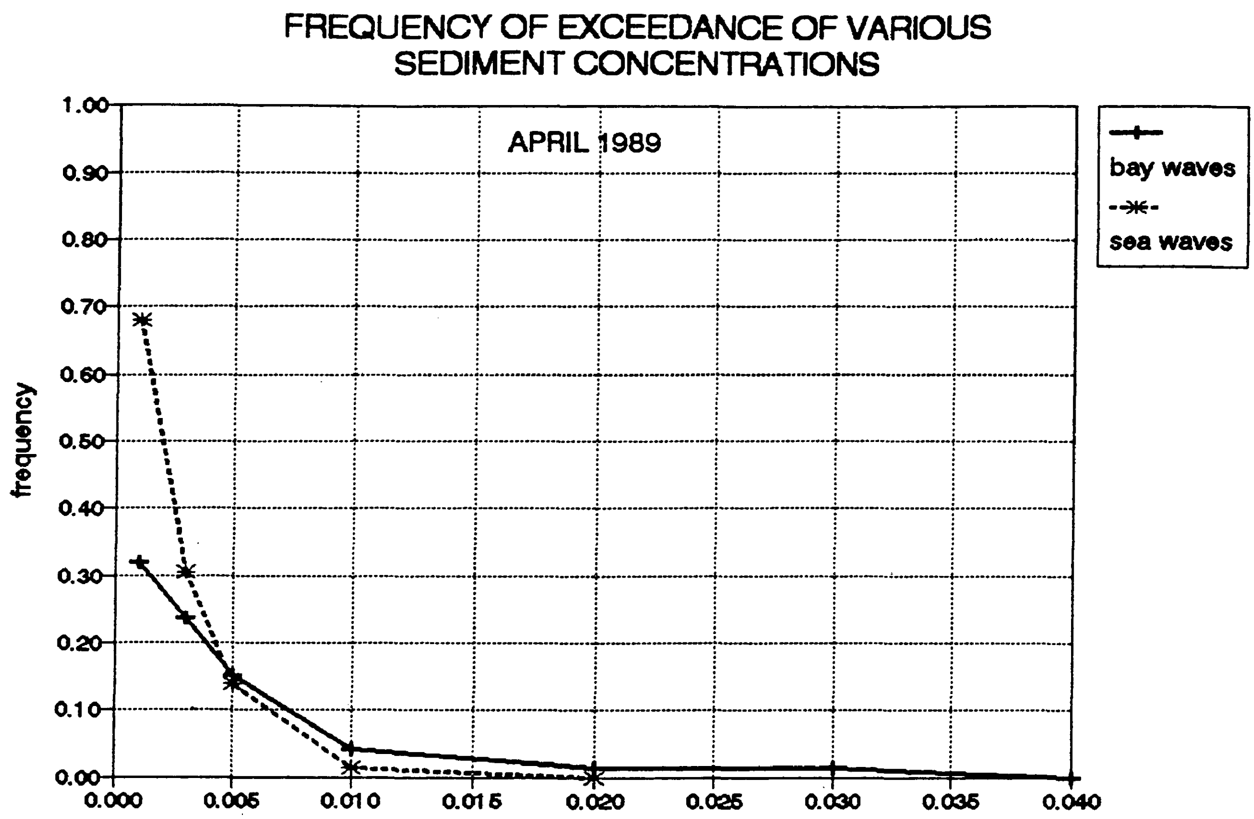


Figure 63

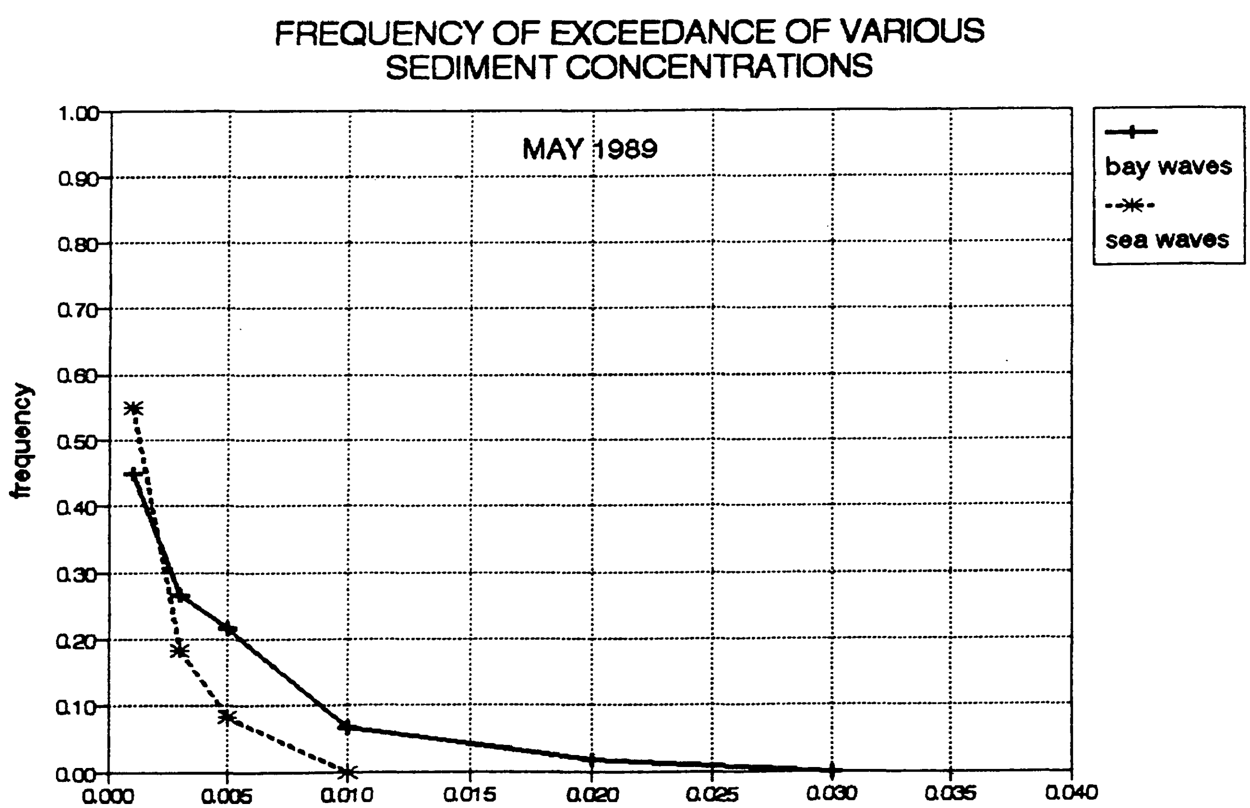


Figure 64

FREQUENCY OF EXCEEDANCE OF VARIOUS SEDIMENT CONCENTRATIONS

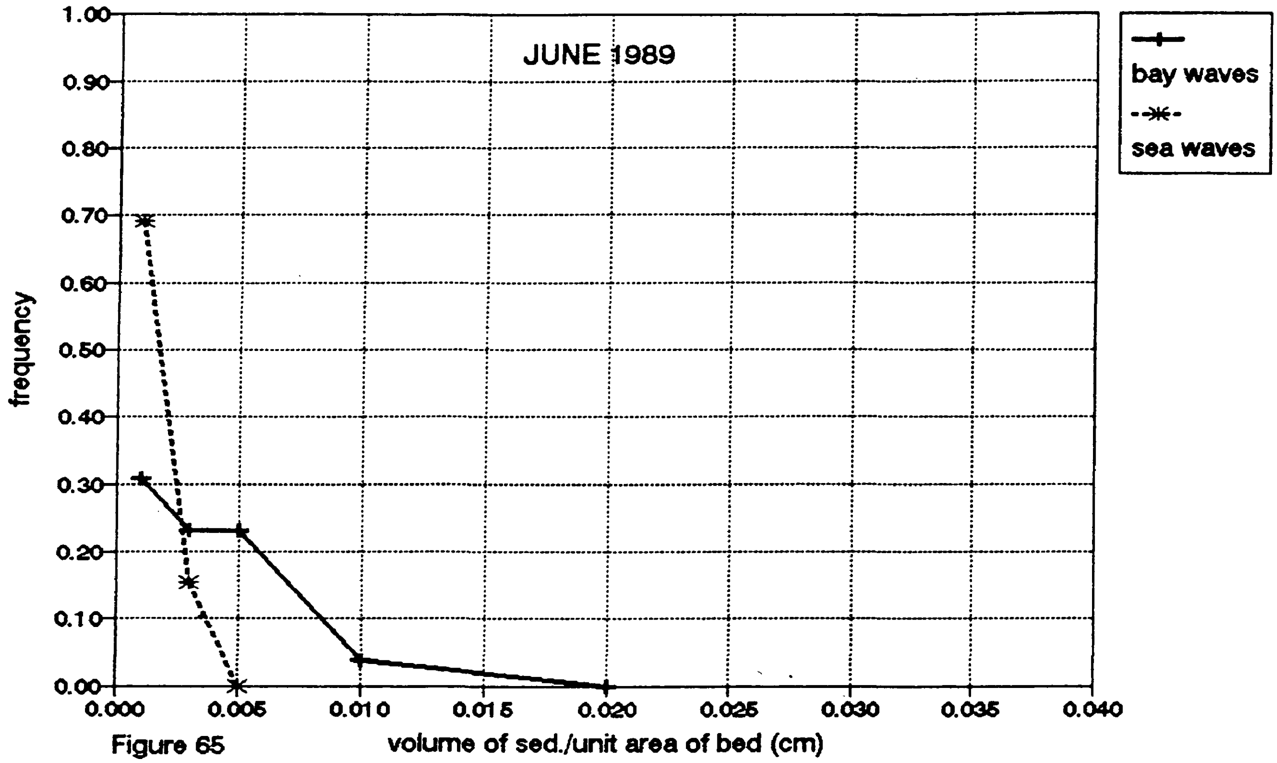


Figure 65

FREQUENCY OF EXCEEDANCE OF VARIOUS SEDIMENT CONCENTRATIONS

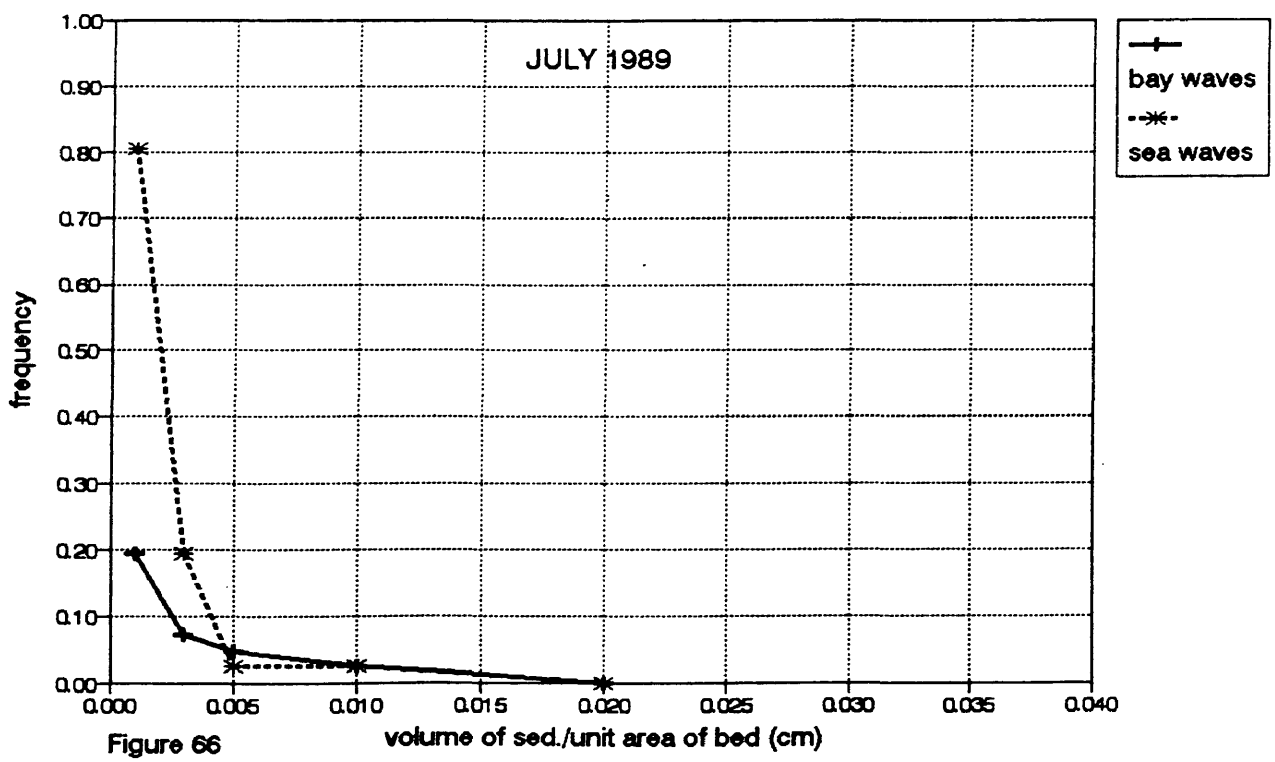


Figure 66

FREQUENCY OF EXCEEDANCE OF VARIOUS SEDIMENT CONCENTRATIONS

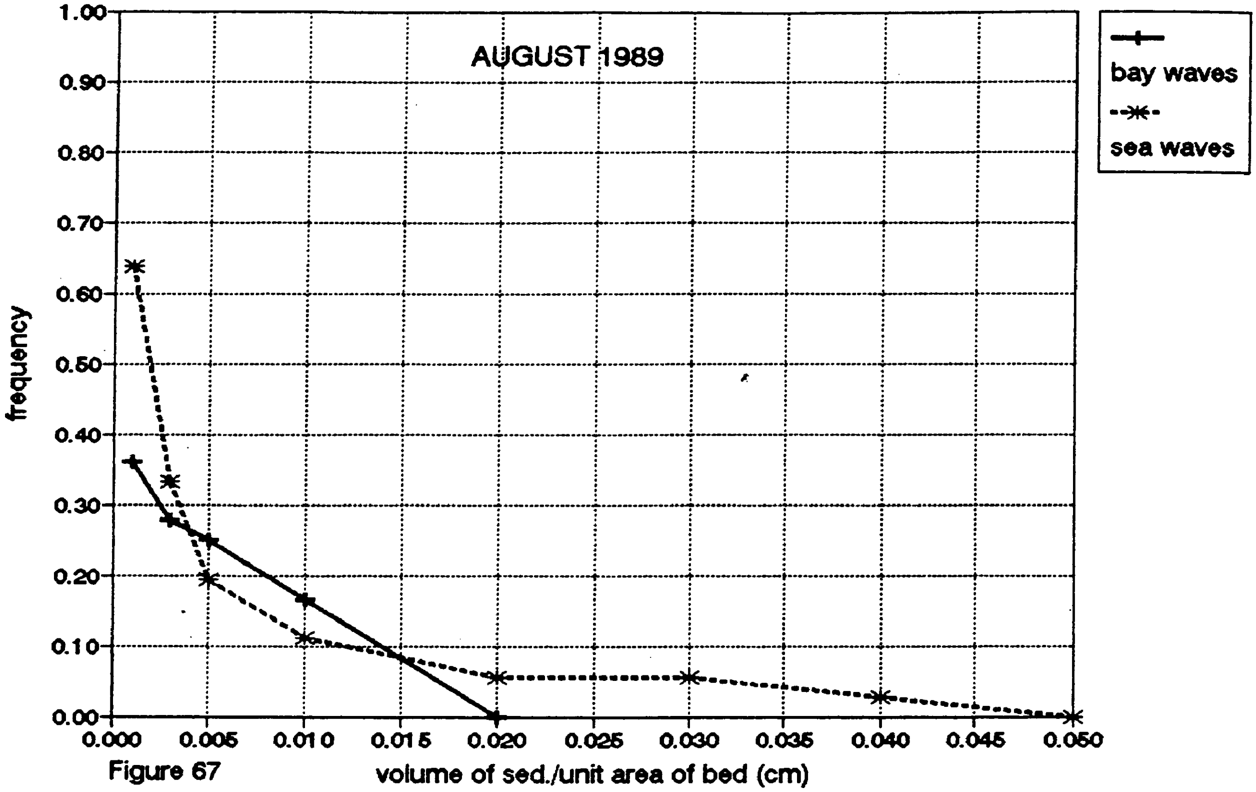


Figure 67

FREQUENCY OF EXCEEDANCE OF VARIOUS SEDIMENT CONCENTRATIONS

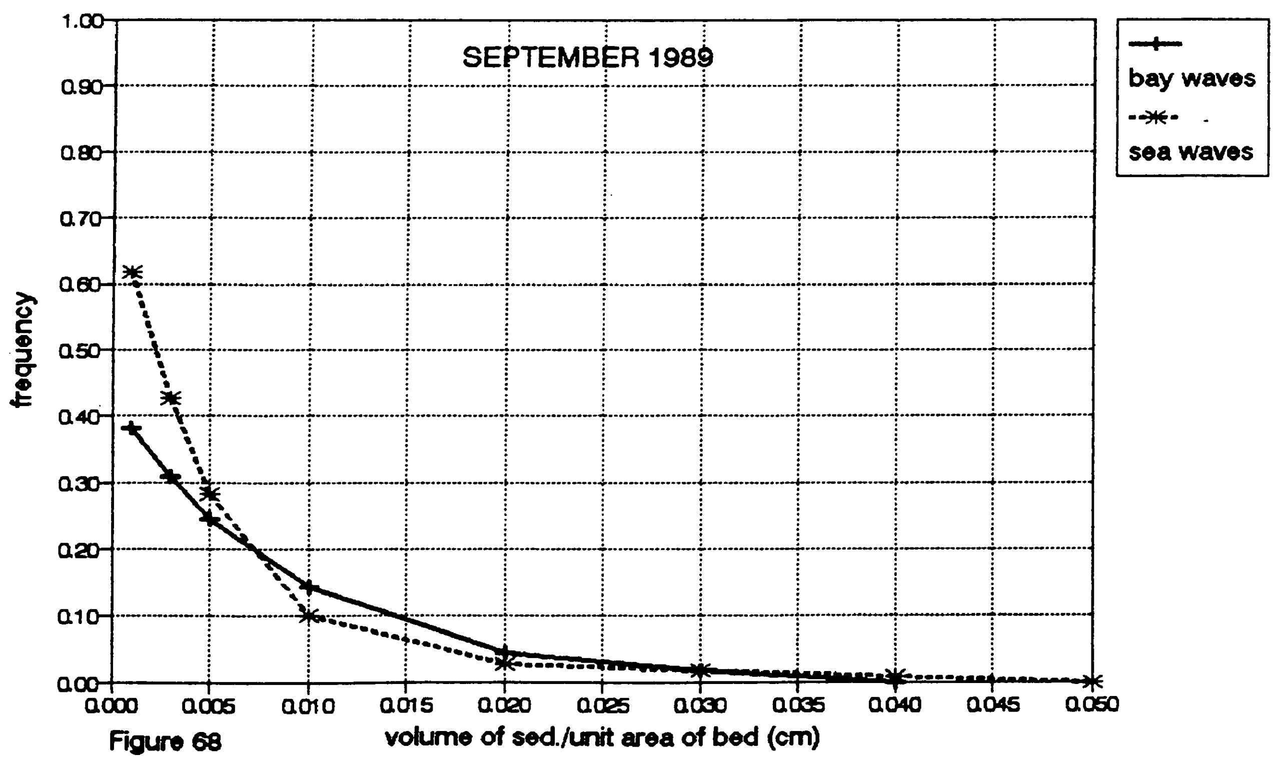


Figure 68

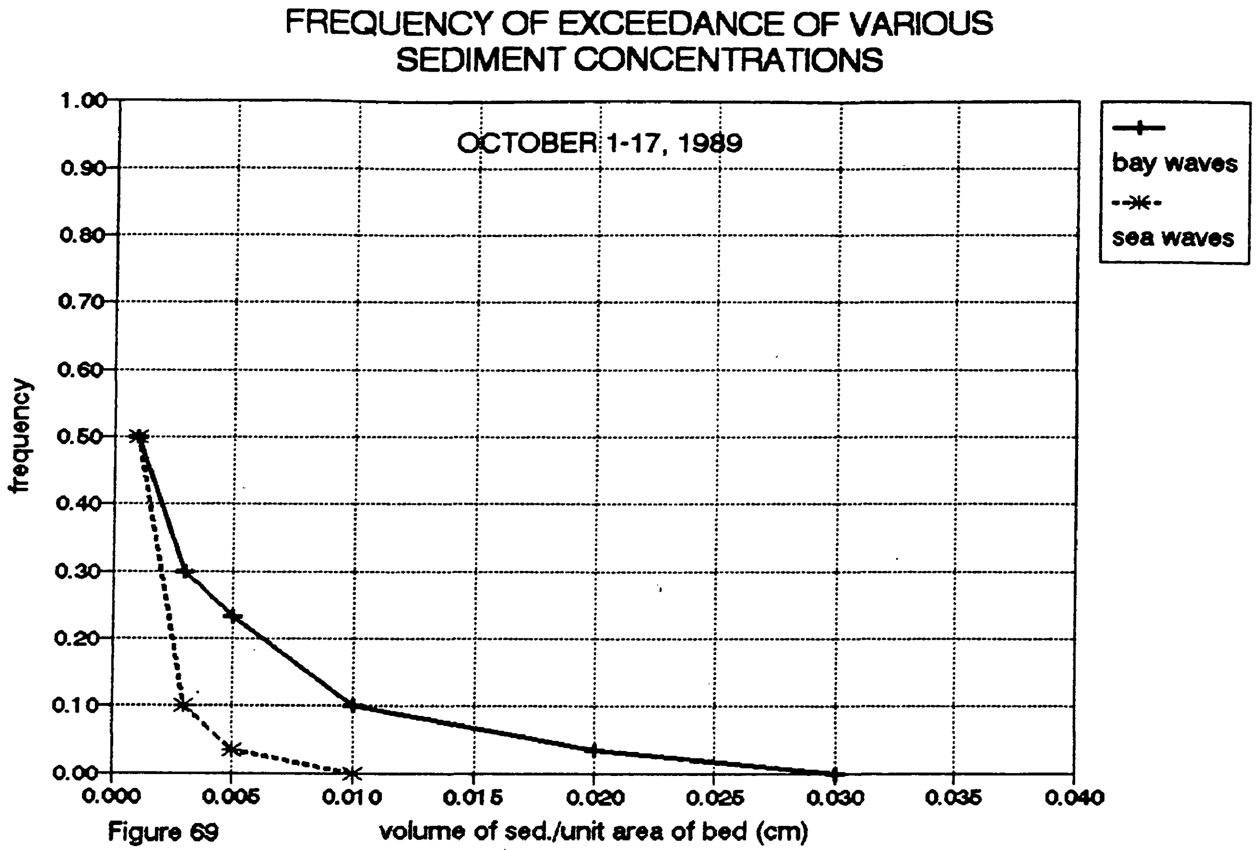

FREQUENCY OF EXCEEDANCE OF VARIOUS
SEDIMENT CONCENTRATIONS
OCTOBER 1-17, 1989
bay waves
sea waves
frequency
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0.040
volume of sed./unit area of bed (cm)

Figure 69

Frequencies here are calculated as the number of bursts during which the resuspension was greater than a particular value (predicted for one of the components), divided by the total number of bursts for which any sediment resuspension was predicted (for both components). Table 11 summarizes the frequency of exceedance data.

During almost all months, predicted resuspension of the smaller amounts of sediment (0.001 cm^3/cm^2 - 0.005 cm^3/cm^2), was most frequently by the sea wave energy component. During almost all months, predicted resuspension of the larger amounts was most frequently by the bay wave energy component. These patterns were observed for all but 4 of the months (DEC88, FEB89, AUG89 and SEP89). In both DEC88 and FEB89, the predicted resuspension of all amounts was most frequent for bay waves. In AUG89 and SEP89, predicted resuspension of both the smallest amounts and the largest amounts was most frequently by sea waves, while predicted resuspension of intermediate amounts was most frequently by bay waves.

Table 11. Frequency of Exceedance of various amounts of predicted resuspension

MONTH	RESUSPENSION (cm /cm)													DUE TO:
	0.001	0.003	0.005	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	
OCT88	0.72	0.39	0.25	0.08	0.01	-	-	-	-	-	-	-	-	sea waves
	0.28	0.21	0.12	0.08	0.02	-	-	-	-	-	-	-	-	bay waves
NOV88	0.51	0.27	0.11	0.02	-	-	-	-	-	-	-	-	-	sea waves
	0.49	0.31	0.20	0.09	0.05	0.02	0.02	-	-	-	-	-	-	bay waves
DEC88	0.50	0.30	0.20	0.11	-	-	-	-	-	-	-	-	-	sea waves
	0.50	0.35	0.28	0.11	0.02	0.02	-	-	-	-	-	-	-	bay waves
JAN89	0.62	0.34	0.23	0.14	0.01	-	-	-	-	-	-	-	-	sea waves
	0.38	0.30	0.28	0.14	0.03	-	-	-	-	-	-	-	-	bay waves
FEB89	0.48	0.30	0.24	0.21	0.15	0.06	0.06	0.03	0.03	0.03	0.01	0.01	-	sea waves
	0.52	0.40	0.34	0.25	0.18	0.12	0.06	0.06	0.06	0.06	0.04	0.03	0.01	bay waves
MAR89	0.52	0.42	0.36	0.24	0.15	0.03	0.02	0.02	-	-	-	-	-	sea waves
	0.48	0.41	0.35	0.29	0.24	0.18	0.10	0.05	0.03	0.01	-	-	-	bay waves
APR89	0.68	0.31	0.14	0.01	-	-	-	-	-	-	-	-	-	sea waves
	0.32	0.24	0.15	0.04	0.01	0.01	-	-	-	-	-	-	-	bay waves
MAY89	0.55	0.18	0.08	-	-	-	-	-	-	-	-	-	-	sea waves
	0.45	0.27	0.22	0.07	0.02	-	-	-	-	-	-	-	-	bay waves
JUN89	0.69	0.15	-	-	-	-	-	-	-	-	-	-	-	sea waves
	0.31	0.23	0.23	0.04	-	-	-	-	-	-	-	-	-	bay waves
JUL89	0.80	0.20	0.02	0.02	-	-	-	-	-	-	-	-	-	sea waves
	0.20	0.07	0.05	0.02	-	-	-	-	-	-	-	-	-	bay waves
AUG89	0.64	0.33	0.19	0.11	0.06	0.06	0.03	-	-	-	-	-	-	sea waves
	0.36	0.28	0.25	0.17	-	-	-	-	-	-	-	-	-	bay waves
SEP89	0.62	0.43	0.28	0.10	0.03	0.02	0.01	-	-	-	-	-	-	sea waves
	0.38	0.31	0.25	0.15	0.05	0.02	-	-	-	-	-	-	-	bay waves
OCT89	0.50	0.10	0.03	-	-	-	-	-	-	-	-	-	-	sea waves
	0.50	0.30	0.23	0.10	0.03	-	-	-	-	-	-	-	-	bay waves

DISCUSSION

During the year October, 1988, to September, 1989, the most frequent sediment resuspension was predicted for the fall/winter months. As stated earlier, fall/winter months were considered to be September - March. Unexpected results were that during the spring months (APR89 and MAY89), the frequency of disturbance of bed sediments did not differ much from that during some of the fall/winter months, and in some cases was slightly greater. During the summer months (JUN89-AUG89), the bed was predicted to remain undisturbed a large majority of the time. In terms of magnitude, the greatest predicted magnitudes of sediment resuspension were during months in which major local winter storms occurred, and the next greatest during months in which hurricanes occured (AUG89 and SEP89). Predicted magnitudes during spring months equaled or exceeded those during fall/winter months in which major local winter storms did not occur. The lowest predicted magnitudes of resuspension were during two summer months (JUN89 and JUL89).

Overall, the net effect of all resuspension events predicted for the Thimble Shoals region of lower Chesapeake Bay indicated that the bed at Thimble Shoals is likely reworked the most by natural physical processes during months in which major local winter storms occur, and during hurricane season months in which major hurricanes make close passes to the mid-Atlantic Bight region. The bed is likely to be reworked an intermediate amount during months with wave energy conditions typified by the 1989 fall/winter months without major local winter storms and spring months. Thimble Shoals bed is likely to be reworked the least by physical processes during months with wave energy conditions typified by those of the 1989 summer months. During summer months; however, biological activity at Thimble Shoals would be greatest and may increase overall bed reworking during this time.

In the discussion of the Thimble Shoals hydrodynamic regime, it was noted that the mean current velocity measured was often greater than 20 cm/s. It is generally thought that currents of this velocity are able to move bed sediments. Current formed ripples may migrate significantly across the seafloor with the mean current. Core samples taken at Thimble Shoals have shown evidence of this type of bedform migration (Schaffner, personal observation). Thus, in considering the total reworking of the bed at Thimble Shoals, the potentially important contribution due to bedform migration should not be neglected.

It is important to emphasize that the predictions made of likely bed reworking at Thimble Shoals by sediment resuspension are only predictions - that resuspension may or may not have actually occurred. Unfortunately, for this study there were no observational resuspension data available for use in testing the model. An instrument for measuring resuspension *in situ* (Optical Backscattering System - OBS) is available; however, it was not part of the instrumentation on the tetrapod used in this study. An avenue for future research would be to compare OBS data to predictions of resuspension made using this model. Once a model has been found to accurately predict resuspension, it must be used in modeling resuspension at a particular site over a period of many years before the resuspension at that site may be accurately characterized. Despite the lack of observational data and lack of longevity of this study, it is encouraging to note that the greatest resuspension was predicted when expected (during high wave energy conditions), and that the least resuspension was also predicted when expected (during low wave energy conditions).

The changing wave energy conditions experienced at Thimble Shoals over the year resulting in varying amounts of bed reworking, can be associated with the changing impacts of the two main wave energy components existing in the lower Bay region. During months in which extreme events such as major local winter storms occurred, the magnitudes of sediment predicted to be resuspended by the bay wave energy component were the greatest of all months and exceeded those predicted for the sea wave component. During months in which major hurricanes occurred; however, it was the sea wave energy component that was predicted to resuspend the greatest magnitudes of sediment. Consistent with the observation that sea waves are a relatively constant source of energy year-round of generally small intensities, these waves were predicted to most frequently be to cause of resuspension events, and those events were most often of small magnitudes. Also, consistent with the observation that bay waves are a more sporadic energy source of greater intensity during fall/winter months and much less intensity during summer months, predicted resuspension events due to these waves were of the greatest magnitude during fall/winter months, of the smallest magnitude during summer months, and occurred less frequently overall than those events due to sea waves. The net effect of the frequency and magnitude of predicted resuspension events due to each wave energy component indicated that sea waves are likely responsible for the greatest amount of bed reworking at Thimble Shoals during a majority of the year.

In modeling sediment resuspension, for sites with relatively narrow grain size distributions, such as that of the Buckroe reserve, differences both in frequency and magnitudes of predicted resuspension between grain sizes are likely to be relatively small. Thus, choice of the mean grain size for use in modeling resuspension should suffice. For a site such as TSC; however, whose grain size distribution is much broader, larger differences are likely to occur in the predicted frequencies and magnitudes of resuspension between grain sizes. In such a case, choice of the mean grain size to represent resuspension of the site may not be adequate. Accurate knowledge of the grain size distribution of a particular site is crucial to the successful prediction of sediment resuspension at that site.

Although there was not much observed roughness data available for comparison of real vs. observed ripple dimensions and ripple roughness, one obvious problem with the roughness model was discovered. The model, as designed for use in this study, did not provide adequate predictions when used to analyze time series data because the model does not take into account the past history of the bed. The model assumes a flat bed to begin with, and predicts subsequent roughness based on this initial flat bed assumption. This is done for each individual burst. Thus, a particular ripple roughness is calculated for each individual burst based on the summary flow conditions of that burst and assuming a flat bed initially. The implications of this are that in one burst the model may predict a ripple roughness of zero, in the next burst it may predict something very large, and in the next burst it may be back to zero. This type of situation does not occur in nature. The problem with the roughness model may be better understood by considering what does actually occur in nature.

In nature, if conditions are sufficiently strong (i.e., θ_c exceeded), ripples will form on a bed. If the energy conditions then change such that the Shields parameter, θ', drops below the critical Shields parameter, θ_c, the ripples formed earlier on the bed will not be altered. Because the Shields parameter has fallen below θ_c, this means that the energy conditions are not sufficient to move the sediment on the bed (the bed shear stress has not reached the critical bed shear stress). Thus, the ripples will not get larger, nor will they get any smaller. The model used in this analysis does not take this previous roughness condition of the bed into account in determining subsequent bed roughness. If in one burst θ_c is exceeded, ripples of particular dimensions will be predicted to develop. If in the next burst θ_c is not exceeded, then the model predicts a plane bed. A plane bed condition would exist in this case (the case of $\theta'<\theta_c$), only if the bed were plane prior to that burst. The only way in which a plane bed condition would have existed prior, would be if θ' had sufficiently exceeded θ_B (Shields parameter for ripple break-off) as with a storm event, such that the ripples may have been wiped out by the flow. With the waning of the storm event, θ' will decrease below θ_B (but still be greater than θ_c) and ripples will begin to form again.

For this analysis, a few problems were identified resulting from the initial flat bed assumption of the roughness model. One problem was the obvious inaccurate prediction of ripple roughness, k_{br}, likely for a large majority of the bursts (i.e., on November 3rd, the model predicts k_{br}=0, when ripples did actually exist on the bed that day). The effects of this inaccuracy are far-reaching. In the model, a comparison is made for each burst, between the ripple roughness and the biological roughness. The one which is greatest is assumed to be the main cause of the form drag roughness and is thus used in the calculation of total bed roughness. The problem with this is that for the site under investigation, ripple roughness should dominate a large majority of the time. Past studies (Wright et al., 1987; Kimball et al., 1989) have indicated that this area of the bed is almost always characterized by ripples. Also, these studies have found the density of benthic organisms (both infauna and epifauna) at this site to be relatively low. Thus, for bursts in which θ_c is not exceeded and K_{br} is predicted to be zero, K_{bi} is used in calculating K_T, and hence K_T is likely mis-calculated. Inaccurate prediction of ripple roughness in the model leads to inaccurate prediction of total bed roughness which causes further error in the estimation of the hydraulic roughness length, z_o. Because of the dependency of the boundary shear stresses on z_o, additional error is introduced in the calculation of these parameters as well.

An area of future research is to address this initial flat bed assumption of the roughness model. One simple approach would be if the Shields parameter of the burst in question does not exceed θ_c, then the roughness condition of the prior burst would be assigned to the present burst. This would alleviate the problem of predicting a plane bed in a case when $\theta' < \theta_c$, when ripples left over from a more energetic time actually exist. This was the reasoning behind comparing observed ripples dimensions and observed k_{br} on November 3rd to the ripple dimension and k_{br} predicted by the model for November 2nd.

As mentioned earlier, the predictions were very different from what was observed. Because of the lack of comparative data, positive conclusions on the accuracy of the model in predicting ripple dimensions and ripple roughness cannot be drawn. However, some possible explanations for the observed discrepancies are given.

One possible explanation for the difference between observed and modeled ripple dimensions may be due to the fact that the model assumes a bed of uniform grain size. Though the grain size distribution of Buckroe reserve sediments was narrow, the bed was not of a single grain size. The mean grain size was used in this analysis to determine boundary roughness. It may be that sediments of a grain size other than the mean were those maintaining the ripples actually observed on the bed at Thimble Shoals. Proper choice of grain size should be an important consideration for future attempts at modeling bed roughness.

Also, something not considered in the roughness model is the idea that roughness elements are presumed to affect the same flows which produce them (Wright, 1989). Changes in shear stress cause changes in bedform geometry; the bedform geometry changes then alter the shear stresses (Wright, 1989). The results of this mutual interaction are not easily predicted by simple cause→effect models (i.e., shear stress→ripples). The inability of models to account for this complexity may be another cause of the noted discrepancy between what is observed in nature and what is predicted.

CONCLUSIONS

Natural physical processes which occur near the seabed are important aspects of understanding a local bottom environment. The bed response to these processes include phenomena such as the deposition, resuspension and transport of bottom sediments. These bed responses are also critical components of the existing environment. They determine to a large extent the chemistry of the sediment-water interface, and the structure of the existing benthic community. Because BBL processes such as sediment resuspension contribute greatly to the nature of a benthic environment, these processes will also affect the condition of that environment following decimation. Thus, as the destruction of benthic environments through human activities such as dredging and disposal becomes more frequent, attempts to understand these environments through an understanding of the processes and responses which characterize them becomes more important.

One way in which dredging and disposal activities become detrimental is by completely decimating pre-existing local benthic communities (Rhoads et al., 1978). Such activities will also destroy habitat and populations of ecologically and commercially important bottom-dwelling species, such as the blue crab in lower Chesapeake Bay (Kimball et al., 1989). In addition, the abundances and availability of invertebrate prey species to demersal fish predators may be altered (Kimball et al., 1989). Because of these detrimental effects, the question of benthic recolonization following dredging or disposal activities has become critical. Knowing the conditions which have allowed a particular benthic community to exist prior to decimation (such as sediment resuspension due to natural physical processes) will likely enhance abilities to asses the likelihood and rapidness of benthic recolonization following decimation. At Thimble Shoals for example, the results of this study indicate that the potential is high for constant reworking of the bed. In environments such as this which are subject to relatively persistant natural disturbance, it is likely that the resident benthic community is relatively resiliant. It is expected that recolonization of a more resiliant community would proceed more rapidly than that of community which is less affected by natural disturbance thus less resiliant (Rhoads et al., 1978).

Sediment resuspension is a process which provides for the exchange of oxygen, nutrients, and pollutants between the water column and the bed. As such, it is important in determining not only benthic community structure, but also the natural transport and fate of pollutants. Thus, knowing the natural resuspension potential of a site may aid in determining its suitability as a disposal site. For a region such as Thimble Shoals which is subject to relatively constant reworking of bed sediments, use of this region to dispose of dredged material would not be recommended.

Because the alteration of benthic environments is a critical issue from both an environmental and commercial point of view, the ability to accurately predict potential effects of dredging and disposal activities has become of utmost importance. This ability is likely to be enhanced by first understanding the existing environment prior to alteration. One means by which to come to this understanding is through the accurate modeling of natural physical process which occur near the seafloor, and the resulting bed response to these processes.

The natural disturbance of a benthic environment is typically affected by both spacial and temporal variability. Variability both in bed conditions and in processes affecting the bed is especially characteristic in shallow water environments, such as those of many estuaries (Wright et al., 1987). In these shallow environments, the natural diversity of benthic fauna and bottom topography interact with a similarly diverse fluid regime (Wright et al., 1987). These interactions affect the organisms living on and within the bottom as well as the transport and fate of sediments (Wright, 1989). Thus, modeling of the response of a bed to natural physical processes may be most helpful if it includes consideration of the inherent variability of that bed site.

In lower Chesapeake Bay, part of the variability affecting benthic environments results from the presence of a dual wave energy source which contributes jointly to the overall energy conditions (Boon et al., 1990). The two wave energy conditions correspond to locally generated waves with a southerly direction of wave advance, and waves generated external to the bay with a west to west-northwest direction of wave advance (Boon et al., 1990). Though Rosen (1976) was one of the first to anticipate the presence of this dual energy source, Boon et al. (1990) were the first to demonstrate its existence through actual wave measurements.

Past efforts to characterize the Chesapeake Bay wave climate focused mainly on hindcasted wave data which took into account only those waves generated within the bay (Boon et al, 1990). The results of Boon et al.'s (1990) study; however, suggest that a major fraction of wave energy affecting the lower bay benthic regions year-round is generated external to the bay. This idea is contrary to the previously held belief that the only significant cases of sediment resuspension will occur during extreme events, such as major winter storms, and thus be caused solely by the locally generated wave energy component. In Chesapeake Bay, only a portion of the wave climate affecting lower benthic environments will be accounted for if only locally generated waves are included in efforts to model bed response. This conclusion, which Boon et al. (1990) hypothesized to be true, was positively confirmed by the present study.

If the modeling of sediment resuspension performed in this study for the Thimble Shoals portion of lower Chesapeake Bay, had considered only the locally generated wave energy, a significant amount of natural reworking of the bed would have been missed. Though locally generated waves resulted in the greatest magnitudes of sediment resuspension, especially during major storms, waves generated external to the bay also caused large amounts of sediment to be resuspended. During major winter storms, magnitudes of sediment resuspended due to sea waves were only slightly less than those due to bay waves; during hurricane season, magnitudes due to sea waves far exceeded those due to bay waves. On a monthly basis, sea waves were demonstrated to be responsible for the major portion of bed reworking in almost every month under investigation. The typical condition of the bed is determined largely by those events which affect it most frequently. As indicated by this study, the externally generated wave energy component was responsible for the most frequent sediment resuspension. Future efforts to model the conditions of the bed in response to natural physical processes, as well as efforts to better understand benthic communities in the lower portions of Chesapeake Bay should not neglect the important contribution of externally generated wave energy in naturally reworking the bed.

APPENDIX

Raw output data from
the boundary layer model

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8810

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
275	0	7.44	0.27	11.6	Sea	7.10	18.2	14.50	0.02	1.20	1.82	1.75	0.52	0.64	0.00660	0.05271	0.00	-0.0013
275	3	7.11	0.23	8.5	Sea	15.70	40.1	11.61	0.02	1.25	1.84	1.64	0.94	0.18	0.00423	0.05668	0.00	-0.0009
275	6	6.80	0.15	9.8	Sea	23.00	18.6	8.37	0.02	1.30	1.82	1.36	1.23	0.09	0.00338	0.06180	0.00	-0.0005
275	9	7.12	0.21	8.5	Sea	12.00	67.8	10.58	0.02	1.01	1.55	1.47	0.73	0.20	0.00436	0.03707	0.00	-0.0027
275	12	7.53	0.28	11.6	Sea	18.50	43.4	14.67	0.86	1.46	5.12	4.84	1.94	3.32	0.01451	0.07745	25.74	0.0009
275	15	7.28	0.23	8.5	Sea	28.90	72.2	11.68	0.50	1.44	4.23	3.90	2.43	1.29	0.00888	0.07576	15.09	0.0008
275	18	6.84	0.17	9.8	Sea	18.80	36.4	9.26	0.02	1.19	1.70	1.39	1.05	0.11	0.00365	0.05142	0.00	-0.0014
275	21	6.85	0.20	9.8	Sea	13.10	59.0	10.82	0.02	1.06	1.59	1.47	0.79	0.19	0.00431	0.04094	0.00	-0.0023
276	0	7.21	0.23	9.8	Sea	16.70	14.8	12.06	0.02	1.34	1.94	1.67	1.00	0.19	0.00430	0.06519	0.00	-0.0002
276	3	7.09	0.23	11.6	Sea	18.50	80.7	12.67	0.02	1.16	1.71	1.60	1.04	0.12	0.00376	0.04886	0.00	-0.0016
276	6	6.75	0.17	11.6	Sea	19.80	8.0	9.50	0.02	1.27	1.79	1.40	1.11	0.12	0.00371	0.05862	0.00	-0.0008
276	9	6.84	0.15	9.8	Sea	20.50	68.8	8.07	0.02	1.04	1.49	1.24	1.06	0.07	0.00315	0.03955	0.00	-0.0025
276	12	7.29	0.22	8.5	Sea	14.10	13.2	11.02	0.02	1.21	1.79	1.58	0.86	0.21	0.00440	0.05365	0.00	-0.0012
276	15	7.27	0.24	11.6	Sea	15.80	86.1	13.14	0.02	1.11	1.67	1.61	0.92	0.16	0.00407	0.04451	0.00	-0.0020
276	18	6.89	0.21	8.5	Sea	20.90	34.3	10.92	0.48	1.37	4.06	3.68	1.84	1.61	0.00987	0.06817	14.40	0.0001
276	21	6.73	0.17	8.5	Sea	19.10	21.9	8.87	0.02	1.22	1.74	1.40	1.06	0.11	0.00364	0.05391	0.00	-0.0012
277	0	7.08	0.20	9.8	Sea	14.40	56.9	10.82	0.02	1.10	1.63	1.48	0.85	0.17	0.00416	0.04383	0.00	-0.0021
277	3	7.17	0.21	8.5	Sea	7.20	75.6	10.64	0.02	0.92	1.47	1.44	0.48	0.37	0.00535	0.03084	0.00	-0.0033
277	6	6.88	0.18	8.5	Sea	24.90	8.2	9.63	0.41	1.46	3.90	3.31	2.07	1.23	0.00869	0.07786	12.36	0.0010
277	9	6.80	0.19	8.5	Sea	34.50	43.3	9.91	0.40	1.69	4.22	3.41	2.73	0.95	0.00775	0.10437	12.00	0.0034
277	12	7.21	0.27	8.5	Sea	14.70	75.1	13.78	0.02	1.23	1.87	1.79	0.90	0.21	0.00444	0.05467	0.00	-0.0011
277	15	7.44	0.35	3.7	Bay	7.70	48.0	6.28	0.02	0.76	1.27	1.21	0.45	0.17	0.00413	0.02111	0.00	-0.0041
277	18	7.24	0.61	4.7	Bay	17.70	35.8	20.26	0.43	1.95	6.55	6.37	1.68	2.24	0.01164	0.13891	12.88	0.0065
277	21	6.95	0.55	4.7	Bay	18.20	78.4	19.05	0.43	1.70	6.11	6.05	1.69	2.03	0.01107	0.10501	12.81	0.0034
278	0	7.18	0.43	3.9	Bay	8.80	60.7	9.80	0.02	1.02	1.69	1.64	0.55	0.24	0.00463	0.03809	0.00	-0.0026
278	3	7.48	0.56	4.7	Bay	18.70	33.7	17.84	0.39	1.83	5.89	5.68	1.71	1.87	0.01063	0.12150	11.65	0.0049
278	6	7.34	0.79	5.1	Bay	20.80	0.9	28.59	0.38	2.60	7.92	7.65	2.06	2.62	0.01268	0.24552	10.35	0.0161
278	9	7.11	1.10	5.6	Bay	17.70	66.5	44.39	0.25	3.28	9.04	8.96	1.85	3.29	0.01442	0.39174	5.44	0.0292
278	12	7.34	0.98	5.1	Bay	15.10	19.6	35.25	0.31	2.85	8.46	8.32	1.57	3.23	0.01427	0.29565	8.02	0.0206
278	15	7.69	0.83	5.1	Bay	15.10	72.0	28.49	0.61	2.28	8.77	8.72	1.64	3.77	0.01563	0.18945	18.39	0.0110
278	18	7.65	0.79	5.6	Bay	24.60	4.2	29.63	0.34	2.74	7.80	7.43	2.37	2.36	0.01198	0.27372	8.90	0.0186
278	21	7.26	0.67	8.5	Sea	24.50	47.5	33.56	0.57	2.73	8.61	8.31	2.69	3.91	0.01599	0.27035	15.92	0.0183
279	0	7.31	0.55	8.5	Sea	13.00	52.0	27.61	1.02	2.13	8.63	8.54	1.63	6.17	0.02166	0.16434	30.54	0.0088
279	3	7.61	0.43	8.5	Sea	14.50	75.2	20.94	0.85	1.66	6.72	6.67	1.64	4.33	0.01705	0.10037	25.56	0.0030
279	6	7.58	0.40	8.5	Sea	21.20	87.5	19.33	0.81	1.57	6.23	6.19	2.20	3.19	0.01416	0.09017	24.12	0.0021
279	9	7.25	0.27	8.5	Sea	11.30	25.0	13.38	0.02	1.27	1.92	1.78	0.74	0.33	0.00517	0.05902	0.00	-0.0007
279	12	7.33	0.29	9.8	Sea	13.30	21.4	15.16	0.76	1.42	5.16	4.97	1.42	3.58	0.01516	0.07365	22.73	0.0006
279	15	7.71	0.33	9.8	Sea	11.00	87.2	16.40	0.02	1.27	1.97	1.95	0.74	0.39	0.00547	0.05876	0.00	-0.0007
279	18	7.76	0.32	8.5	Sea	8.30	88.8	15.48	0.02	1.22	1.92	1.92	0.58	0.50	0.00598	0.05397	0.00	-0.0012
279	21	7.35	0.29	11.6	Sea	18.20	4.4	15.41	0.88	1.57	5.42	5.06	1.95	3.61	0.01525	0.09003	26.24	0.0021
280	0	7.29	0.31	3.9	Bay	27.20	18.5	6.85	0.14	1.41	3.00	2.42	1.80	0.35	0.00528	0.07202	4.06	0.0005
280	3	7.59	0.40	4.1	Bay	18.40	30.8	9.48	0.02	1.29	1.94	1.68	1.03	0.12	0.00371	0.06038	0.00	-0.0006
280	6	7.66	0.42	9.8	Sea	3.80	46.7	21.01	1.01	1.56	6.74	6.72	0.50	7.22	0.02433	0.08817	30.40	0.0019
280	9	7.28	0.37	3.5	Bay	22.90	77.2	5.57	0.02	1.00	1.45	1.20	1.12	0.04	0.00277	0.03630	0.00	-0.0028
280	12	7.10	0.26	3.5	Bay	29.90	29.1	4.23	0.02	1.31	1.80	1.12	1.45	0.04	0.00272	0.06221	0.00	-0.0004
280	15	7.38	0.24	9.8	Sea	13.40	61.6	12.66	0.02	1.17	1.76	1.65	0.83	0.23	0.00456	0.04989	0.00	-0.0015
280	18	7.61	0.25	9.8	Sea	20.40	35.1	12.78	0.64	1.45	4.62	4.26	1.95	2.28	0.01176	0.07635	19.03	0.0008
280	21	7.23	0.24	3.7	Bay	26.00	25.2	4.54	0.02	1.20	1.69	1.13	1.28	0.04	0.00283	0.05278	0.00	-0.0013
281	0	6.96	0.23	11.6	Sea	19.80	77.9	12.70	0.02	1.20	1.76	1.61	1.10	0.12	0.00367	0.05276	0.00	-0.0013
281	3	7.31	0.25	9.8	Sea	18.50	30.7	13.05	0.65	1.42	4.66	4.34	1.81	2.50	0.01235	0.07362	19.57	0.0006

281	6	7.58	0.39	4.1	Bay	19.60	47.0	9.48	0.02	1.27	1.92	1.67	1.08	0.11	0.00357	0.05902	0.00	-0.0007
281	9	7.32	0.44	4.7	Bay	21.60	32.2	14.37	0.32	1.68	4.97	4.67	1.83	1.32	0.00899	0.10305	9.70	0.0032
281	12	6.95	0.74	4.7	Bay	28.10	66.4	25.76	0.48	2.37	8.00	7.80	2.67	2.24	0.01165	0.20379	13.76	0.0123
281	15	7.21	0.72	4.4	Bay	23.50	10.6	21.25	0.40	2.24	6.97	6.63	2.16	1.93	0.01078	0.18255	11.90	0.0104
281	18	7.59	0.51	4.7	Bay	12.70	78.2	15.80	0.38	1.42	5.16	5.13	1.17	1.94	0.01080	0.07316	11.42	0.0006
281	21	7.32	0.69	4.4	Bay	16.50	55.1	20.14	0.41	1.87	6.45	6.34	1.55	2.14	0.01137	0.12738	12.12	0.0054
282	0	6.98	0.53	5.1	Bay	24.80	82.7	20.01	0.47	1.81	6.40	6.32	2.28	1.92	0.01077	0.11853	14.19	0.0046
282	3	7.19	0.39	4.7	Bay	9.40	27.7	13.12	0.02	1.30	2.05	1.97	0.62	0.35	0.00524	0.06101	0.00	-0.0005
282	6	7.66	0.50	4.7	Bay	20.30	39.2	15.34	0.35	1.69	5.20	4.95	1.76	1.49	0.00949	0.10369	10.34	0.0033
282	9	7.54	0.55	4.4	Bay	29.70	12.3	15.32	0.30	2.04	5.50	4.95	2.42	1.10	0.00828	0.15131	8.91	0.0076
282	12	7.10	0.68	5.1	Bay	23.80	67.2	25.26	0.55	2.23	7.94	7.79	2.36	2.66	0.01277	0.18105	16.45	0.0103
282	15	7.23	0.51	8.5	Sea	3.00	16.5	25.84	1.00	1.89	8.09	8.08	0.41	7.87	0.02602	0.12943	29.99	0.0056
282	18	7.71	0.60	11.6	Sea	23.30	27.2	31.33	0.91	2.59	8.77	8.35	2.82	5.53	0.02006	0.24312	26.44	0.0159
282	21	7.62	0.56	11.6	Sea	31.80	66.8	29.34	1.14	2.43	8.86	8.50	3.69	4.76	0.01813	0.21553	33.46	0.0134
283	0	7.16	0.42	11.6	Sea	24.00	61.8	22.81	1.19	1.96	7.48	7.20	2.79	4.82	0.01827	0.13915	35.61	0.0065
283	3	7.22	0.41	11.6	Sea	6.90	56.5	22.00	1.24	1.61	7.05	7.02	0.94	7.87	0.02602	0.09470	37.08	0.0025
283	6	7.74	0.47	11.6	Sea	19.80	24.6	24.30	1.23	2.10	7.97	7.62	2.45	5.90	0.02099	0.16106	36.83	0.0085
283	9	7.70	0.45	11.6	Sea	26.30	79.5	23.49	1.24	1.89	7.55	7.39	3.03	4.63	0.01782	0.13054	37.12	0.0057
283	12	7.20	0.38	14.2	Sea	16.50	45.2	20.82	1.39	1.72	6.90	6.66	2.09	6.42	0.02230	0.10821	41.75	0.0037
283	15	7.19	0.38	14.2	Sea	21.30	41.0	20.95	1.36	1.87	7.08	6.69	2.59	5.63	0.02030	0.12721	40.67	0.0054
283	18	7.67	0.43	14.2	Sea	10.70	7.2	22.90	1.52	1.76	7.42	7.27	1.50	8.65	0.02805	0.11317	45.50	0.0042
283	21	7.62	0.40	14.2	Sea	14.50	70.6	21.69	1.49	1.63	7.03	6.93	1.90	7.11	0.02406	0.09627	44.51	0.0026
284	0	7.05	0.27	14.2	Sea	29.00	14.4	15.06	0.98	1.86	5.81	5.00	2.99	3.10	0.01392	0.12523	29.32	0.0052
284	3	7.03	0.27	11.6	Sea	23.50	55.7	14.66	0.84	1.53	5.18	4.83	2.36	2.80	0.01316	0.08565	25.21	0.0017
284	6	7.52	0.29	11.6	Sea	15.60	20.7	15.26	0.89	1.47	5.28	5.01	1.71	3.88	0.01591	0.07882	26.68	0.0011
284	9	7.58	0.25	14.2	Sea	12.60	84.2	13.66	0.02	1.08	1.63	1.58	0.79	0.25	0.00468	0.04225	0.00	-0.0022
284	12	7.00	0.17	11.6	Sea	12.70	8.9	9.58	0.02	1.06	1.54	1.33	0.77	0.20	0.00437	0.04055	0.00	-0.0024
284	15	6.81	0.17	11.6	Sea	27.70	45.2	9.45	0.56	1.43	3.90	3.27	2.37	1.40	0.00921	0.07406	16.73	0.0006
284	18	7.22	0.24	9.8	Sea	9.40	70.2	12.73	0.02	1.08	1.67	1.62	0.62	0.36	0.00528	0.04227	0.00	-0.0022
284	21	7.30	0.25	11.6	Sea	7.00	52.3	13.43	0.02	1.10	1.68	1.63	0.50	0.57	0.00630	0.04390	0.00	-0.0021
285	0	6.74	0.20	11.6	Sea	18.00	21.2	11.36	0.02	1.31	1.87	1.56	1.05	0.16	0.00407	0.06242	0.00	-0.0004
285	3	6.51	0.14	3.1	Bay	28.30	62.9	1.84	0.02	1.05	1.39	0.69	1.29	0.02	0.00240	0.04006	0.00	-0.0024
285	6	7.06	0.16	7.5	Bay	25.80	74.9	7.98	0.02	1.17	1.64	1.32	1.28	0.05	0.00288	0.04968	0.00	-0.0016
285	9	7.33	0.20	11.6	Sea	7.30	57.0	10.45	0.02	0.91	1.40	1.34	0.49	0.39	0.00547	0.02999	0.00	-0.0033
285	12	6.87	0.15	7.5	Sea	12.20	8.8	7.54	0.02	0.95	1.41	1.22	0.71	0.15	0.00401	0.03257	0.00	-0.0031
285	15	6.62	0.07	9.8	Sea	28.80	53.6	3.81	0.02	1.15	1.54	0.86	1.36	0.03	0.00258	0.04852	0.00	-0.0017
285	18	7.05	0.12	9.8	Sea	19.70	73.3	6.54	0.02	0.92	1.30	1.06	0.99	0.05	0.00295	0.03087	0.00	-0.0033
285	21	7.32	0.15	8.5	Sea	12.50	39.5	7.69	0.02	0.92	1.36	1.20	0.72	0.14	0.00393	0.03054	0.00	-0.0033
286	0	6.95	0.28	4.4	Bay	18.60	66.4	8.70	0.02	1.11	1.69	1.52	1.00	0.09	0.00342	0.04469	0.00	-0.0020
286	3	6.71	0.23	4.1	Bay	26.30	31.8	6.58	0.02	1.33	1.89	1.38	1.34	0.06	0.00303	0.06428	0.00	-0.0002
286	6	7.18	0.37	4.4	Bay	19.80	50.6	11.01	0.25	1.36	3.89	3.67	1.55	0.92	0.00765	0.06720	7.53	0.0000
286	9	7.53	0.24	5.1	Bay	21.50	19.5	8.30	0.02	1.30	1.89	1.50	1.16	0.09	0.00343	0.06158	0.00	-0.0005
286	12	7.16	0.30	4.7	Bay	29.00	32.7	9.97	0.23	1.62	3.93	3.37	2.14	0.66	0.00668	0.09501	6.84	0.0025
286	15	6.72	0.23	4.4	Bay	28.10	78.0	7.63	0.02	1.23	1.76	1.44	1.38	0.04	0.00279	0.05509	0.00	-0.0011
286	18	7.04	0.28	4.1	Bay	21.50	14.1	7.61	0.02	1.28	1.87	1.48	1.15	0.08	0.00335	0.05965	0.00	-0.0007
286	21	7.45	0.62	4.7	Bay	8.60	82.8	19.91	0.45	1.66	6.33	6.33	0.87	2.85	0.01329	0.09969	13.53	0.0029
287	0	7.15	0.54	4.4	Bay	19.40	85.0	16.24	0.36	1.51	5.27	5.23	1.69	1.50	0.00954	0.08241	10.66	0.0014
287	3	6.79	0.48	3.9	Bay	29.90	44.6	11.89	0.22	1.74	4.38	3.92	2.21	0.68	0.00674	0.10975	6.49	0.0038
287	6	7.10	0.33	4.4	Bay	17.00	34.6	9.97	0.02	1.27	1.92	1.69	0.97	0.14	0.00386	0.05833	0.00	-0.0008
287	9	7.54	0.30	5.1	Bay	23.10	20.2	10.45	0.27	1.49	3.93	3.51	1.81	0.91	0.00760	0.08084	8.00	0.0012
287	12	7.30	0.36	4.7	Bay	27.90	27.5	11.80	0.26	1.71	4.43	3.92	2.16	0.86	0.00745	0.10699	7.90	0.0036
287	15	6.77	0.34	4.7	Bay	29.60	86.3	12.33	0.30	1.43	4.17	4.04	2.26	0.79	0.00718	0.07463	8.87	0.0007
287	18	6.92	0.32	4.1	Bay	16.60	5.1	8.90	0.02	1.23	1.85	1.60	0.94	0.13	0.00380	0.05488	0.00	-0.0011
287	21	7.34	0.25	5.1	Bay	18.40	67.2	8.86	0.02	1.09	1.65	1.48	1.00	0.09	0.00344	0.04358	0.00	-0.0021
288	0	7.23	0.31	4.7	Bay	17.80	20.4	10.18	0.02	1.32	1.98	1.71	1.02	0.14	0.00388	0.06366	0.00	-0.0003
288	3	6.78	0.27	4.1	Bay	25.80	88.3	7.69	0.02	1.10	1.61	1.42	1.26	0.04	0.00278	0.04431	0.00	-0.0020
288	6	6.95	0.18	4.4	Bay	12.20	20.9	5.52	0.02	0.84	1.28	1.10	0.67	0.10	0.00357	0.02553	0.00	-0.0037
288	9	7.45	0.13	8.5	Sea	28.70	9.1	6.27	0.28	1.38	3.10	2.29	2.09	0.62	0.00652	0.06933	8.25	0.0002
288	12	7.36	0.19	8.5	Sea	37.70	49.0	9.46	0.38	1.74	4.18	3.28	2.89	0.81	0.00726	0.11064	11.33	0.0039
288	15	6.79	0.11	5.6	Bay	19.90	82.4	4.57	0.02	0.82	1.15	0.93	0.95	0.04	0.00266	0.02431	0.00	-0.0038

288	18	6.80	0.12	8.5	Sea	14.00	57.1	6.40	0.02	0.83	1.22	1.05	0.76	0.09	0.00344	0.02501	0.00	-0.0038
288	21	7.17	0.13	8.5	Sea	12.50	11.4	6.74	0.02	0.89	1.31	1.10	0.71	0.13	0.00383	0.02889	0.00	-0.0034
289	0	7.14	0.13	9.8	Sea	18.00	57.6	6.80	0.02	0.95	1.36	1.10	0.94	0.07	0.00322	0.03307	0.00	-0.0031
289	3	6.69	0.09	9.8	Sea	27.00	2.2	5.16	0.02	1.25	1.70	1.04	1.34	0.05	0.00289	0.05706	0.00	-0.0009
289	6	6.73	0.10	8.5	Sea	18.30	70.4	5.28	0.02	0.84	1.18	0.94	0.91	0.05	0.00289	0.02556	0.00	-0.0037
289	9	7.25	0.11	9.8	Sea	19.60	4.7	5.64	0.02	1.04	1.45	1.02	1.02	0.07	0.00318	0.03925	0.00	-0.0025
289	12	7.35	0.11	9.8	Sea	17.60	86.4	5.54	0.02	0.75	1.07	0.91	0.86	0.04	0.00278	0.02072	0.00	-0.0042
289	15	6.84	0.11	9.8	Sea	23.90	73.8	6.17	0.02	1.02	1.41	1.06	1.16	0.04	0.00275	0.03817	0.00	-0.0026
289	18	6.66	0.08	5.1	Bay	19.50	15.8	3.35	0.02	0.91	1.27	0.83	0.96	0.05	0.00284	0.02992	0.00	-0.0033
289	21	6.97	0.15	9.8	Sea	17.00	73.2	7.98	0.02	0.93	1.35	1.19	0.90	0.08	0.00332	0.03113	0.00	-0.0032
290	0	7.13	0.14	9.8	Sea	9.60	25.3	7.55	0.02	0.84	1.26	1.13	0.58	0.20	0.00436	0.02554	0.00	-0.0037
290	3	6.75	0.13	9.8	Sea	19.90	35.6	7.31	0.02	1.11	1.56	1.20	1.06	0.08	0.00332	0.04469	0.00	-0.0020
290	6	6.67	0.09	8.5	Sea	13.40	48.9	4.83	0.02	0.74	1.07	0.87	0.71	0.08	0.00325	0.01983	0.00	-0.0042
290	9	7.15	0.14	7.5	Sea	15.20	21.6	6.94	0.02	0.99	1.44	1.18	0.84	0.11	0.00361	0.03533	0.00	-0.0028
290	12	7.43	0.15	8.5	Sea	22.90	42.4	7.32	0.02	1.19	1.67	1.25	1.19	0.07	0.00316	0.05158	0.00	-0.0014
290	15	7.09	0.16	8.5	Sea	33.60	38.4	8.01	0.33	1.58	3.69	2.84	2.53	0.73	0.00696	0.09104	9.97	0.0022
290	18	6.81	0.15	9.8	Sea	3.90	39.4	8.20	0.02	0.73	1.17	1.14	0.28	0.52	0.00608	0.01963	0.00	-0.0043
290	21	7.03	0.14	9.8	Sea	8.50	46.9	7.40	0.02	0.77	1.18	1.09	0.52	0.21	0.00444	0.02152	0.00	-0.0041
291	0	7.31	0.16	11.6	Sea	15.30	32.2	8.37	0.02	1.03	1.48	1.23	0.87	0.13	0.00381	0.03857	0.00	-0.0026
291	3	7.08	0.16	11.6	Sea	14.60	53.4	8.53	0.02	0.96	1.40	1.22	0.83	0.13	0.00378	0.03373	0.00	-0.0030
291	6	6.85	0.16	11.6	Sea	14.30	8.0	9.14	0.02	1.08	1.55	1.31	0.84	0.17	0.00411	0.04221	0.00	-0.0022
291	9	7.15	0.17	9.8	Sea	9.70	89.8	8.96	0.02	0.78	1.24	1.22	0.58	0.19	0.00429	0.02210	0.00	-0.0040
291	12	7.55	0.22	8.5	Sea	13.10	36.8	10.57	0.02	1.12	1.67	1.51	0.79	0.20	0.00438	0.04583	0.00	-0.0019
291	15	7.35	0.22	8.5	Sea	20.50	64.7	10.91	0.02	1.23	1.79	1.57	1.13	0.10	0.00356	0.05516	0.00	-0.0011
291	18	6.95	0.20	9.8	Sea	13.00	13.0	10.99	0.02	1.17	1.72	1.52	0.80	0.23	0.00456	0.04945	0.00	-0.0016
291	21	6.99	0.18	9.8	Sea	14.80	83.7	9.72	0.02	0.92	1.40	1.33	0.83	0.12	0.00370	0.03108	0.00	-0.0032
292	0	7.35	0.27	8.5	Sea	13.20	4.4	13.55	0.02	1.35	2.01	1.82	0.85	0.29	0.00493	0.06666	0.00	-0.0000
292	3	7.23	0.23	8.5	Sea	8.50	72.1	11.43	0.02	1.00	1.57	1.53	0.56	0.34	0.00519	0.03614	0.00	-0.0028
292	6	6.87	0.17	9.8	Sea	12.70	2.0	9.34	0.02	1.06	1.55	1.35	0.76	0.19	0.00432	0.04071	0.00	-0.0024
292	9	6.91	0.27	9.8	Sea	13.50	89.6	14.26	0.02	1.15	1.78	1.75	0.83	0.23	0.00457	0.04801	0.00	-0.0017
292	15	7.30	0.28	9.8	Sea	14.30	48.6	14.57	0.02	1.35	2.01	1.85	0.91	0.27	0.00481	0.06643	0.00	-0.0001
292	18	6.93	0.23	11.6	Sea	9.30	42.7	12.51	0.02	1.10	1.66	1.57	0.62	0.39	0.00545	0.04430	0.00	-0.0020
292	21	6.76	0.23	9.8	Sea	25.20	49.8	12.54	0.61	1.51	4.62	4.18	2.30	1.89	0.01067	0.08329	18.35	0.0015
293	0	7.16	0.28	8.5	Sea	29.40	73.4	14.25	0.59	1.58	4.96	4.66	2.62	1.68	0.01007	0.09030	17.76	0.0021
293	3	7.31	0.31	9.8	Sea	14.90	4.9	16.01	0.78	1.53	5.46	5.22	1.60	3.62	0.01526	0.08561	23.30	0.0017
293	6	7.04	0.49	11.6	Sea	28.30	29.4	26.99	0.97	2.48	8.30	7.72	3.24	4.56	0.01763	0.22332	28.16	0.0141
293	9	6.85	0.30	11.6	Sea	28.50	9.5	16.72	0.87	1.96	6.18	5.46	2.92	3.02	0.01371	0.14001	26.06	0.0066
293	12	7.25	0.28	11.6	Sea	18.90	13.4	15.37	0.87	1.58	5.42	5.04	2.01	3.52	0.01501	0.09137	26.09	0.0022
293	15	7.42	0.25	11.6	Sea	22.80	49.2	13.52	0.79	1.49	4.87	4.49	2.25	2.60	0.01261	0.08034	23.54	0.0012
293	18	7.17	0.33	14.2	Sea	27.70	89.6	18.31	1.29	1.52	6.01	5.91	3.00	3.75	0.01558	0.08457	38.57	0.0016
293	21	6.79	0.23	11.6	Sea	25.10	4.1	12.60	0.71	1.62	4.87	4.23	2.40	2.29	0.01180	0.09573	21.19	0.0026
294	0	7.15	0.30	11.6	Sea	10.90	73.3	16.31	0.02	1.29	1.95	1.90	0.74	0.42	0.00561	0.06012	0.00	-0.0006
294	3	7.44	0.36	11.6	Sea	14.50	42.9	19.39	1.09	1.64	6.41	6.23	1.73	5.28	0.01944	0.09727	32.51	0.0027
294	6	7.25	0.33	14.2	Sea	15.20	54.0	18.37	1.29	1.52	6.13	5.96	1.87	5.77	0.02066	0.08438	38.70	0.0016
294	9	6.90	0.34	3.9	Bay	28.00	50.3	8.31	0.16	1.43	3.29	2.85	1.91	0.43	0.00566	0.07448	4.90	0.0007
294	12	7.11	0.25	11.6	Sea	21.10	36.6	13.69	0.79	1.50	4.94	4.54	2.12	2.82	0.01320	0.08175	23.76	0.0013
294	15	7.55	0.23	11.6	Sea	20.50	15.4	12.06	0.71	1.44	4.51	4.06	2.00	2.48	0.01230	0.07506	21.30	0.0007
294	18	7.43	0.22	14.2	Sea	27.80	71.9	12.12	0.88	1.39	4.45	4.07	2.63	2.18	0.01149	0.07075	26.45	0.0003
294	21	6.90	0.18	11.6	Sea	19.60	20.9	10.27	0.02	1.29	1.83	1.47	1.11	0.13	0.00380	0.06092	0.00	-0.0005
295	0	7.00	0.23	9.8	Sea	10.70	34.7	12.23	0.02	1.15	1.73	1.61	0.70	0.32	0.00508	0.04838	0.00	-0.0017
295	3	7.48	0.24	11.6	Sea	14.10	21.9	12.76	0.02	1.28	1.86	1.65	0.88	0.25	0.00471	0.05948	0.00	-0.0007
295	6	7.42	0.22	11.6	Sea	24.50	85.0	11.92	0.02	1.22	1.74	1.56	1.27	0.07	0.00317	0.05388	0.00	-0.0012
295	9	6.89	0.20	14.2	Sea	20.30	11.3	11.15	0.82	1.36	4.30	3.80	2.02	2.70	0.01289	0.06768	24.56	0.0001
295	12	6.87	0.23	11.6	Sea	23.70	69.7	13.02	0.78	1.37	4.59	4.33	2.28	2.33	0.01190	0.06780	23.46	0.0001
295	15	7.42	0.32	5.6	Bay	19.20	17.5	12.40	0.35	1.50	4.40	4.10	1.64	1.38	0.00915	0.08146	10.31	0.0013
295	18	7.51	0.30	4.4	Bay	27.80	76.4	8.49	0.02	1.28	1.84	1.54	1.39	0.05	0.00290	0.05922	0.00	-0.0007
295	21	6.81	0.25	11.6	Sea	33.00	31.8	14.20	0.75	1.90	5.57	4.73	3.11	2.16	0.01142	0.13196	22.40	0.0058
296	0	6.59	0.17	8.5	Sea	36.30	42.9	9.31	0.37	1.72	4.13	3.24	2.80	0.84	0.00734	0.10771	11.20	0.0037
296	3	7.18	0.31	8.5	Sea	25.90	24.6	15.84	0.62	1.84	5.68	5.16	2.47	2.27	0.01173	0.12304	18.57	0.0050
296	6	7.38	0.31	6.7	Sea	18.90	55.8	13.92	0.47	1.44	4.76	4.57	1.73	1.87	0.01063	0.07583	14.21	0.0008

296	9	6.95	0.21	9.8	Sea	31.50	46.6	11.10	0.53	1.64	4.45	3.77	2.67	1.35	0.00907	0.09755	15.74	0.0028
296	12	6.57	0.13	9.8	Sea	35.20	24.6	7.38	0.35	1.63	3.72	2.68	2.65	0.74	0.00698	0.09674	10.48	0.0027
296	15	7.06	0.25	9.8	Sea	23.90	51.5	13.28	0.65	1.51	4.78	4.40	2.24	2.11	0.01130	0.08287	19.45	0.0014
296	18	7.45	0.24	9.8	Sea	22.10	30.2	12.49	0.61	1.50	4.61	4.17	2.07	2.11	0.01128	0.08139	18.36	0.0013
296	21	7.02	0.19	14.2	Sea	19.70	18.7	10.81	0.02	1.32	1.85	1.48	1.13	0.14	0.00388	0.06304	0.00	-0.0004
297	0	6.57	0.08	14.2	Sea	38.40	69.1	4.55	0.33	1.45	2.93	1.79	2.63	0.44	0.00570	0.07603	9.80	0.0008
297	3	7.04	0.17	9.8	Sea	29.00	20.1	8.83	0.43	1.52	3.86	3.09	2.36	1.10	0.00828	0.08415	12.90	0.0015
297	6	7.51	0.14	11.6	Sea	24.90	3.4	7.56	0.02	1.32	1.81	1.26	1.31	0.07	0.00323	0.06331	0.00	-0.0003
297	9	7.17	0.17	11.6	Sea	19.70	78.4	9.50	0.02	1.03	1.49	1.31	1.04	0.08	0.00326	0.03867	0.00	-0.0025
297	12	6.56	0.13	9.8	Sea	36.00	11.2	7.27	0.34	1.67	3.78	2.66	2.70	0.72	0.00692	0.10178	10.23	0.0031
297	15	6.78	0.12	8.5	Sea	33.10	23.3	6.30	0.27	1.51	3.28	2.32	2.36	0.55	0.00622	0.08289	8.00	0.0014
297	18	7.32	0.14	9.8	Sea	28.50	22.1	7.27	0.37	1.41	3.39	2.61	2.21	0.86	0.00743	0.07230	10.95	0.0005
297	21	7.05	0.14	11.6	Sea	28.90	67.3	7.40	0.02	1.26	1.71	1.22	1.41	0.04	0.00278	0.05742	0.00	-0.0009
298	0	6.45	0.08	14.2	Sea	32.60	3.5	4.95	0.36	1.41	3.08	1.93	2.40	0.66	0.00667	0.07272	10.76	0.0005
298	3	6.60	0.21	9.8	Sea	25.80	7.9	11.56	0.55	1.60	4.54	3.91	2.31	1.73	0.01023	0.09270	16.56	0.0023
298	6	7.31	0.15	8.5	Sea	35.70	13.6	7.60	0.31	1.69	3.80	2.74	2.64	0.68	0.00674	0.10355	9.22	0.0033
298	9	7.24	0.13	14.2	Sea	43.10	35.1	6.98	0.46	1.83	4.12	2.62	3.29	0.80	0.00721	0.12149	13.67	0.0049
298	12	6.55	0.09	11.6	Sea	32.00	38.3	5.03	0.02	1.36	1.81	1.03	1.54	0.04	0.00271	0.06699	0.00	-0.0000
298	15	6.51	0.11	14.2	Sea	36.20	83.6	6.22	0.02	1.35	1.77	1.10	1.66	0.02	0.00244	0.06631	0.00	-0.0001
298	18	7.22	0.17	6.1	Sea	28.30	5.8	7.30	0.23	1.45	3.29	2.59	2.03	0.57	0.00630	0.07682	6.72	0.0009
298	21	7.22	0.18	11.6	Sea	21.40	86.8	9.68	0.02	1.03	1.47	1.32	1.10	0.06	0.00308	0.03829	0.00	-0.0026
299	0	6.70	0.10	9.8	Sea	42.10	72.5	5.32	0.26	1.59	3.12	2.02	2.77	0.35	0.00524	0.09142	7.64	0.0022
299	3	6.68	0.14	4.1	Bay	39.00	27.8	3.99	0.08	1.59	2.69	1.58	2.22	0.13	0.00384	0.09196	2.40	0.0022
299	6	7.51	0.16	6.7	Bay	31.90	56.5	7.13	0.25	1.42	3.17	2.53	2.24	0.50	0.00598	0.07321	7.33	0.0006
299	9	7.60	0.14	14.2	Sea	33.30	6.9	7.49	0.52	1.58	3.86	2.74	2.72	1.12	0.00833	0.09084	15.56	0.0021
299	12	6.90	0.15	14.2	Sea	31.20	27.8	8.75	0.61	1.55	4.04	3.11	2.68	1.42	0.00927	0.08718	18.33	0.0018
299	15	6.64	0.10	5.1	Bay	34.00	4.6	3.84	0.10	1.43	2.53	1.52	2.02	0.18	0.00419	0.07416	2.99	0.0006
299	18	7.17	0.17	9.8	Sea	21.60	29.9	8.68	0.02	1.26	1.77	1.37	1.17	0.09	0.00344	0.05739	0.00	-0.0009
299	21	7.34	0.14	9.8	Sea	23.00	53.8	7.52	0.02	1.15	1.61	1.23	1.18	0.06	0.00310	0.04850	0.00	-0.0017
300	0	6.78	0.13	11.6	Sea	28.20	27.5	7.51	0.45	1.39	3.47	2.69	2.27	1.04	0.00808	0.07064	13.42	0.0003
300	3	6.50	0.06	14.2	Sea	45.10	54.2	3.47	0.24	1.68	3.15	1.50	2.90	0.30	0.00499	0.10295	7.02	0.0032
300	6	7.15	0.17	14.2	Sea	27.30	41.8	9.20	0.67	1.40	3.90	3.21	2.42	1.64	0.00994	0.07150	20.03	0.0004
300	9	7.55	0.13	14.2	Sea	30.00	38.2	7.03	0.51	1.39	3.43	2.56	2.43	1.07	0.00815	0.07004	15.38	0.0003
300	12	7.05	0.15	14.2	Sea	26.40	33.6	8.65	0.64	1.37	3.75	3.05	2.32	1.57	0.00975	0.06844	19.01	0.0001
300	15	6.56	0.10	4.4	Bay	41.90	2.0	3.40	0.07	1.67	2.73	1.42	2.33	0.11	0.00365	0.10158	2.14	0.0031
300	18	7.00	0.13	11.6	Sea	33.20	79.9	7.26	0.02	1.31	1.76	1.22	1.57	0.03	0.00257	0.06257	0.00	-0.0004
300	21	7.44	0.14	11.6	Sea	17.60	13.3	7.54	0.02	1.08	1.52	1.18	0.97	0.10	0.00357	0.04226	0.00	-0.0022
301	0	7.14	0.25	14.2	Sea	18.30	50.2	14.06	1.03	1.37	4.95	4.67	1.99	3.77	0.01564	0.06826	30.91	0.0001
301	3	6.68	0.31	3.9	Bay	34.90	32.0	7.93	0.15	1.69	3.53	2.77	2.30	0.35	0.00525	0.10433	4.37	0.0034
301	6	7.12	0.23	11.6	Sea	22.50	34.0	12.81	0.74	1.50	4.74	4.28	2.19	2.48	0.01231	0.08164	22.24	0.0013
301	9	7.70	0.17	3.7	Bay	36.30	41.1	2.80	0.05	1.41	2.19	1.18	1.92	0.08	0.00328	0.07210	1.57	0.0005
301	12	7.38	0.20	11.6	Sea	32.20	28.0	10.89	0.60	1.71	4.62	3.74	2.82	1.55	0.00968	0.10638	17.93	0.0035
301	15	6.75	0.13	11.6	Sea	30.50	61.8	7.08	0.02	1.32	1.78	1.21	1.49	0.04	0.00277	0.06345	0.00	-0.0003
301	18	6.89	0.16	11.6	Sea	27.30	77.7	9.11	0.02	1.22	1.68	1.34	1.36	0.05	0.00287	0.05400	0.00	-0.0012
301	21	7.38	0.20	11.6	Sea	27.00	9.9	10.89	0.62	1.58	4.45	3.73	2.44	1.80	0.01041	0.09071	18.51	0.0021
302	0	7.18	0.22	11.6	Sea	17.70	71.6	11.99	0.02	1.16	1.70	1.55	1.01	0.13	0.00384	0.04876	0.00	-0.0016
302	3	6.67	0.16	4.4	Bay	27.00	23.5	5.23	0.02	1.28	1.78	1.20	1.34	0.05	0.00288	0.05928	0.00	-0.0007
302	6	6.83	0.14	4.1	Bay	25.40	72.1	4.11	0.02	1.02	1.40	0.99	1.20	0.03	0.00258	0.03784	0.00	-0.0026
302	9	7.44	0.16	9.8	Sea	30.80	18.0	8.13	0.39	1.54	3.75	2.89	2.43	0.94	0.00773	0.08649	11.80	0.0018
302	12	7.36	0.14	9.8	Sea	29.60	76.2	7.40	0.02	1.23	1.68	1.24	1.43	0.04	0.00270	0.05543	0.00	-0.0010
302	15	6.75	0.14	9.8	Sea	20.30	25.6	7.42	0.02	1.15	1.61	1.22	1.09	0.08	0.00336	0.04804	0.00	-0.0017
302	18	6.70	0.12	9.8	Sea	25.20	44.8	6.30	0.02	1.19	1.63	1.13	1.27	0.05	0.00295	0.05154	0.00	-0.0014
302	21	7.19	0.16	9.8	Sea	23.40	5.9	8.40	0.02	1.33	1.86	1.37	1.26	0.09	0.00339	0.06446	0.00	-0.0002
303	0	7.30	0.18	11.6	Sea	6.90	19.0	9.94	0.02	0.91	1.39	1.31	0.47	0.41	0.00558	0.03022	0.00	-0.0033
303	3	6.91	0.52	4.4	Bay	30.70	49.3	16.19	0.32	1.98	5.60	5.19	2.51	1.13	0.00835	0.14299	9.52	0.0068
303	6	6.90	0.48	4.4	Bay	35.50	9.9	15.24	0.29	2.22	5.68	4.94	2.81	0.97	0.00781	0.17884	8.57	0.0101
303	9	7.47	0.49	4.7	Bay	21.90	89.3	15.77	0.38	1.46	5.12	5.10	1.88	1.43	0.00931	0.07781	11.26	0.0010
303	12	7.57	0.31	4.7	Bay	25.10	22.7	9.68	0.23	1.50	3.75	3.28	1.88	0.72	0.00690	0.08234	6.83	0.0014
303	15	7.06	0.26	4.4	Bay	26.50	36.1	8.06	0.18	1.41	3.28	2.79	1.86	0.50	0.00597	0.07273	5.43	0.0005
303	18	6.80	0.19	9.8	Sea	21.30	55.0	10.27	0.02	1.25	1.79	1.49	1.16	0.10	0.00350	0.05698	0.00	-0.0009

303	21	7.10	0.17	9.8	Sea	9.10	38.8	8.89	0.02	0.89	1.36	1.26	0.57	0.25	0.00470	0.02910	0.00	-0.0034
304	0	7.32	0.15	11.6	Sea	21.90	85.2	8.26	0.02	0.98	1.39	1.19	1.09	0.05	0.00291	0.03529	0.00	-0.0029
304	3	6.99	0.16	9.8	Sea	18.10	43.9	8.34	0.02	1.09	1.56	1.28	0.99	0.10	0.00353	0.04335	0.00	-0.0021
304	6	6.81	0.14	8.5	Sea	28.90	23.3	7.44	0.32	1.44	3.41	2.65	2.19	0.77	0.00709	0.07528	9.62	0.0007
304	9	7.19	0.23	3.5	Bay	20.60	43.5	3.61	0.02	0.94	1.33	0.94	1.01	0.04	0.00278	0.03181	0.00	-0.0032
304	12	7.52	0.21	9.8	Sea	18.70	17.5	10.78	0.02	1.32	1.89	1.56	1.08	0.15	0.00394	0.06312	0.00	-0.0003
304	15	7.22	0.30	3.9	Bay	18.90	34.5	6.84	0.02	1.12	1.66	1.36	1.01	0.08	0.00332	0.04541	0.00	-0.0019
304	18	6.90	0.24	4.4	Bay	24.20	61.0	7.50	0.02	1.21	1.75	1.42	1.23	0.06	0.00304	0.05323	0.00	-0.0012
304	21	7.03	0.34	4.1	Bay	19.60	2.7	9.29	0.02	1.35	2.00	1.68	1.09	0.11	0.00366	0.06589	0.00	-0.0001
305	0	7.42	0.26	4.1	Bay	20.30	86.3	6.36	0.02	0.91	1.36	1.22	1.01	0.05	0.00286	0.03008	0.00	-0.0033
305	3	7.27	0.30	4.7	Bay	17.20	0.9	9.85	0.02	1.30	1.94	1.67	0.99	0.14	0.00390	0.06127	0.00	-0.0005
305	6	6.93	0.27	3.9	Bay	16.60	86.8	6.46	0.02	0.83	1.31	1.23	0.85	0.06	0.00309	0.02513	0.00	-0.0038
305	9	7.10	0.27	4.1	Bay	15.50	27.6	7.33	0.02	1.06	1.61	1.38	0.86	0.11	0.00361	0.04094	0.00	-0.0023
305	12	7.47	0.24	5.1	Bay	23.20	3.0	8.44	0.22	1.38	3.38	2.91	1.72	0.69	0.00678	0.06915	6.66	0.0002
305	15	7.36	0.22	14.2	Sea	29.90	74.4	11.96	0.86	1.43	4.43	4.02	2.77	1.99	0.01097	0.07400	25.87	0.0006
305	18	6.97	0.21	14.2	Sea	17.80	36.5	12.10	0.02	1.29	1.84	1.56	1.05	0.17	0.00414	0.06088	0.00	-0.0006
305	21	6.94	0.21	14.2	Sea	20.30	46.3	12.07	0.02	1.33	1.88	1.57	1.16	0.14	0.00385	0.06429	0.00	-0.0002

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8811

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
306	0	7.29	0.27	6.7	Sea	13.60	6.0	12.29	0.02	1.31	1.97	1.78	0.85	0.24	0.00463	0.06277	0.00	-0.0004
306	3	7.27	0.28	5.1	Bay	14.20	58.3	10.00	0.02	1.11	1.72	1.60	0.83	0.16	0.00402	0.04479	0.00	-0.0020
306	6	7.09	0.79	4.4	Bay	7.40	40.4	23.96	0.47	2.00	7.48	7.45	0.78	3.34	0.01456	0.14562	14.04	0.0071
306	9	7.12	0.64	5.1	Bay	14.20	0.3	23.62	0.53	2.11	7.48	7.34	1.47	3.15	0.01405	0.16237	15.72	0.0086
306	12	7.42	0.73	4.7	Bay	13.90	68.8	23.32	0.49	1.97	7.32	7.27	1.41	2.90	0.01341	0.14114	14.78	0.0067
306	15	7.53	0.84	7.5	Bay	21.40	46.0	39.33	0.38	3.03	8.76	8.54	2.31	3.70	0.01546	0.33442	9.68	0.0241
306	18	7.17	0.64	9.8	Sea	23.80	77.6	33.51	1.05	2.46	9.56	9.44	2.91	5.71	0.02051	0.22026	30.64	0.0138
306	21	6.94	0.44	9.8	Sea	19.40	32.5	23.67	1.02	2.07	7.72	7.42	2.28	4.98	0.01868	0.15538	30.57	0.0080
307	0	7.19	0.40	7.5	Bay	8.90	27.1	19.14	0.70	1.60	6.20	6.13	1.00	4.21	0.01676	0.09313	20.94	0.0024
307	3	7.35	0.32	8.5	Sea	15.10	42.2	15.80	0.67	1.49	5.32	5.15	1.56	3.09	0.01389	0.08023	20.17	0.0012
307	6	7.06	0.25	8.5	Sea	16.10	59.2	12.64	0.02	1.25	1.87	1.72	0.96	0.18	0.00422	0.05727	0.00	-0.0009
307	9	6.90	0.29	9.8	Sea	30.40	4.3	15.89	0.69	2.00	5.96	5.20	2.92	2.34	0.01191	0.14524	20.80	0.0070
307	12	7.19	0.29	3.5	Bay	19.50	44.2	4.54	0.02	0.96	1.40	1.07	0.98	0.05	0.00294	0.03363	0.00	-0.0030
307	15	7.34	0.34	9.8	Sea	8.30	60.9	17.84	0.90	1.40	5.83	5.79	0.98	5.14	0.01907	0.07180	26.89	0.0004
307	18	7.06	0.26	4.7	Bay	10.50	56.0	8.80	0.02	0.96	1.54	1.46	0.63	0.19	0.00426	0.03380	0.00	-0.0030
307	21	6.76	0.14	14.2	Sea	37.50	3.1	8.28	0.55	1.77	4.31	3.01	3.09	1.17	0.00848	0.11346	16.44	0.0042
308	0	6.83	0.12	9.8	Sea	27.40	11.2	6.61	0.02	1.35	1.84	1.21	1.40	0.06	0.00304	0.06622	0.00	-0.0001
308	3	7.08	0.16	9.8	Sea	14.00	19.2	8.32	0.02	1.02	1.49	1.26	0.81	0.15	0.00397	0.03795	0.00	-0.0026
308	6	6.92	0.15	9.8	Sea	9.60	67.4	8.28	0.02	0.80	1.24	1.17	0.58	0.20	0.00432	0.02351	0.00	-0.0039
308	9	6.59	0.10	14.2	Sea	26.10	16.7	5.77	0.02	1.23	1.67	1.04	1.31	0.05	0.00296	0.05544	0.00	-0.0010
308	12	6.70	0.12	9.8	Sea	27.30	84.7	6.36	0.02	1.08	1.46	1.09	1.29	0.03	0.00258	0.04208	0.00	-0.0022
308	15	7.00	0.15	14.2	Sea	10.40	13.5	8.23	0.02	0.89	1.29	1.13	0.64	0.21	0.00445	0.02858	0.00	-0.0035
308	18	6.94	0.16	14.2	Sea	15.10	82.2	9.12	0.02	0.87	1.28	1.19	0.83	0.10	0.00354	0.02768	0.00	-0.0035
308	21	6.53	0.11	11.6	Sea	17.80	31.7	6.30	0.02	0.98	1.38	1.04	0.94	0.08	0.00330	0.03510	0.00	-0.0029
309	0	6.57	0.12	11.6	Sea	14.50	66.3	6.91	0.02	0.82	1.19	1.03	0.78	0.09	0.00340	0.02453	0.00	-0.0038
309	3	6.98	0.13	11.6	Sea	20.80	6.8	6.89	0.02	1.14	1.59	1.14	1.10	0.08	0.00331	0.04768	0.00	-0.0017
309	6	6.98	0.13	11.6	Sea	22.60	85.3	7.00	0.02	0.95	1.32	1.08	1.10	0.04	0.00274	0.03291	0.00	-0.0031
309	9	6.62	0.12	9.8	Sea	22.50	39.1	6.74	0.02	1.15	1.59	1.16	1.16	0.06	0.00312	0.04780	0.00	-0.0017
309	12	6.63	0.12	11.6	Sea	16.80	39.8	6.98	0.02	0.97	1.38	1.09	0.91	0.09	0.00343	0.03450	0.00	-0.0029
309	15	7.00	0.17	11.6	Sea	12.20	14.5	9.36	0.02	1.02	1.50	1.30	0.74	0.21	0.00439	0.03812	0.00	-0.0026
309	18	7.11	0.13	11.6	Sea	26.80	76.3	7.14	0.02	1.13	1.54	1.15	1.30	0.04	0.00273	0.04660	0.00	-0.0018
309	21	6.78	0.17	11.6	Sea	19.80	66.9	9.53	0.02	1.10	1.57	1.34	1.06	0.09	0.00339	0.04394	0.00	-0.0021
310	0	6.67	0.19	11.6	Sea	12.70	52.6	10.75	0.02	1.05	1.56	1.42	0.77	0.21	0.00441	0.04015	0.00	-0.0024
310	3	7.12	0.36	6.1	Sea	20.20	4.6	15.73	0.45	1.74	5.42	5.09	1.86	1.95	0.01085	0.11002	13.48	0.0039
310	6	7.33	0.42	8.5	Sea	37.10	85.9	21.12	0.81	1.96	6.84	6.64	3.56	2.33	0.01190	0.14026	24.11	0.0066
310	9	6.98	0.27	7.5	Sea	24.20	81.8	13.13	0.02	1.34	1.98	1.82	1.30	0.09	0.00340	0.06540	0.00	-0.0001
310	12	6.71	0.32	7.5	Sea	4.70	24.6	16.44	0.02	1.34	2.11	2.08	0.37	0.89	0.00754	0.06572	0.00	-0.0001
310	15	7.05	0.43	7.5	Sea	7.30	8.9	21.17	0.75	1.70	6.77	6.72	0.86	4.95	0.01859	0.10568	22.58	0.0035
310	18	7.22	0.37	9.8	Sea	12.80	78.9	19.17	0.94	1.49	6.22	6.18	1.48	4.72	0.01802	0.08071	28.24	0.0012
310	21	6.96	0.37	9.8	Sea	9.60	58.7	19.61	0.95	1.54	6.36	6.30	1.16	5.42	0.01977	0.08602	28.51	0.0017
311	0	6.71	0.29	9.8	Sea	25.30	54.7	15.67	0.74	1.66	5.48	5.11	2.47	2.51	0.01238	0.10059	22.07	0.0030
311	3	7.09	0.40	9.8	Sea	20.50	81.5	21.08	0.99	1.68	6.79	6.71	2.28	4.12	0.01654	0.10315	29.56	0.0033
311	6	7.39	0.33	9.8	Sea	9.20	1.3	16.94	0.85	1.44	5.61	5.51	1.06	4.71	0.01800	0.07508	25.31	0.0007
311	9	7.12	0.23	9.8	Sea	3.50	57.1	12.15	0.02	0.98	1.56	1.54	0.27	0.86	0.00744	0.03524	0.00	-0.0029
311	12	6.74	0.18	9.8	Sea	22.40	82.2	10.11	0.02	1.11	1.61	1.42	1.16	0.07	0.00315	0.04520	0.00	-0.0020
311	15	6.94	0.27	8.5	Sea	24.70	17.9	13.87	0.56	1.70	5.09	4.58	2.28	1.98	0.01093	0.10523	16.77	0.0034
311	18	7.32	0.29	8.5	Sea	7.30	22.9	14.59	0.02	1.26	1.93	1.87	0.53	0.58	0.00633	0.05743	0.00	-0.0009
311	21	7.09	0.18	9.8	Sea	11.80	36.2	9.75	0.02	1.02	1.52	1.37	0.72	0.21	0.00443	0.03803	0.00	-0.0026
312	0	6.59	0.15	3.1	Bay	38.40	78.0	1.91	0.03	1.36	1.90	0.87	1.84	0.04	0.00267	0.06767	0.92	0.0001
312	3	6.83	0.17	8.5	Sea	34.40	85.0	8.68	0.38	1.37	3.37	2.96	2.54	0.67	0.00670	0.06845	11.44	0.0001

312	6	7.38	0.27	7.5	Sea	19.30	17.6	12.71	0.48	1.48	4.56	4.22	1.76	1.86	0.01059	0.07994	14.34	0.0012
312	9	7.14	0.17	8.5	Sea	24.50	47.3	8.68	0.02	1.30	1.83	1.41	1.28	0.07	0.00322	0.06145	0.00	-0.0005
312	15	6.81	0.10	7.5	Sea	32.70	63.7	5.07	0.02	1.31	1.76	1.08	1.54	0.03	0.00258	0.06259	0.00	-0.0004
312	18	7.24	0.17	7.5	Sea	18.80	19.8	8.27	0.02	1.18	1.70	1.37	1.04	0.11	0.00358	0.05099	0.00	-0.0014
312	21	7.09	0.18	8.5	Sea	7.20	69.3	9.13	0.02	0.83	1.32	1.29	0.47	0.31	0.00503	0.02517	0.00	-0.0038
313	0	6.70	0.10	9.8	Sea	22.30	35.8	5.48	0.02	1.08	1.48	1.02	1.13	0.05	0.00298	0.04214	0.00	-0.0022
313	3	6.90	0.17	5.1	Bay	26.30	71.4	6.61	0.02	1.16	1.63	1.28	1.29	0.04	0.00279	0.04890	0.00	-0.0016
313	6	7.37	0.18	7.5	Sea	23.70	26.1	8.79	0.02	1.36	1.92	1.47	1.27	0.09	0.00337	0.06694	0.00	-0.0000
313	9	7.25	0.17	8.5	Sea	31.60	83.0	8.55	0.02	1.30	1.78	1.39	1.52	0.04	0.00268	0.06139	0.00	-0.0005
313	12	6.64	0.12	14.2	Sea	21.60	9.7	6.85	0.02	1.16	1.59	~~1.11~~	~~1.14~~	~~0.08~~	~~0.00326~~	~~0.04862~~	~~0.00~~	~~-0.0017~~
313	15	6.62	0.09	11.6	Sea	22.30	89.2	4.83	0.02	0.85	1.14	0.85	1.04	0.03	0.00250	0.02608	0.00	-0.0037
313	18	7.10	0.16	6.1	Sea	21.60	14.5	6.97	0.02	1.21	1.72	1.30	1.14	0.08	0.00327	0.05321	0.00	-0.0012
313	21	7.09	0.17	14.2	Sea	10.80	85.4	9.63	0.02	0.81	1.24	1.20	0.64	0.18	0.00423	0.02405	0.00	-0.0039
314	0	6.64	0.10	4.7	Bay	29.00	38.7	3.85	0.02	1.22	1.66	0.99	1.39	0.04	0.00266	0.05429	0.00	-0.0011
314	3	6.79	0.11	4.7	Bay	43.10	73.9	3.96	0.09	1.59	2.63	1.56	2.41	0.12	0.00369	0.09152	2.74	0.0022
314	6	7.39	0.46	4.4	Bay	25.70	34.4	13.05	0.27	1.72	4.67	4.27	2.04	0.98	0.00784	0.10714	8.13	0.0036
314	9	7.48	0.23	4.4	Bay	23.50	63.8	6.59	0.02	1.12	1.62	1.30	1.18	0.05	0.00294	0.04594	0.00	-0.0019
314	12	6.87	0.25	4.4	Bay	24.40	24.3	7.89	0.18	1.37	3.20	2.73	1.72	0.52	0.00608	0.06807	5.38	0.0001
314	15	6.70	0.15	3.7	Bay	20.80	66.1	3.25	0.02	0.86	1.20	0.85	0.99	0.03	0.00262	0.02676	0.00	-0.0036
314	18	7.16	0.16	11.6	Sea	23.40	4.5	8.64	0.02	1.33	1.85	1.36	1.26	0.09	0.00341	0.06479	0.00	-0.0002
314	21	7.26	0.13	11.6	Sea	27.20	70.6	6.74	0.02	1.16	1.57	1.13	1.32	0.04	0.00274	0.04881	0.00	-0.0016
315	0	6.81	0.13	11.6	Sea	22.00	37.5	7.32	0.02	1.16	1.61	1.19	1.15	0.07	0.00321	0.04889	0.00	-0.0016
315	3	6.69	0.11	11.6	Sea	14.60	63.1	6.21	0.02	0.80	1.15	0.97	0.77	0.08	0.00330	0.02308	0.00	-0.0040
315	6	7.25	0.15	7.5	Sea	23.10	2.4	7.11	0.02	1.26	1.77	1.28	1.21	0.07	0.00324	0.05778	0.00	-0.0008
315	9	7.44	0.11	8.5	Sea	38.10	71.2	5.59	0.24	1.47	2.95	2.07	2.52	0.35	0.00527	0.07872	7.16	0.0011
315	12	6.94	0.14	5.1	Bay	29.20	71.6	5.27	0.02	1.19	1.62	1.14	1.39	0.03	0.00261	0.05112	0.00	-0.0014
315	15	6.58	0.19	7.5	Sea	22.70	39.4	9.97	0.39	1.36	3.80	3.39	1.88	1.20	0.00860	0.06735	11.64	0.0000
315	18	6.97	0.19	6.7	Sea	16.80	57.2	9.11	0.02	1.09	1.62	1.43	0.94	0.11	0.00366	0.04303	0.00	-0.0022
315	21	7.23	0.17	6.7	Sea	17.20	35.6	7.99	0.02	1.10	1.60	1.33	0.95	0.11	0.00358	0.04369	0.00	-0.0021
316	0	6.90	0.15	5.6	Bay	17.30	25.9	6.33	0.02	1.02	1.49	1.19	0.93	0.08	0.00336	0.03814	0.00	-0.0026
316	3	6.69	0.08	5.1	Bay	33.00	20.9	3.05	0.02	1.33	1.78	0.89	1.55	0.03	0.00257	0.06461	0.00	-0.0002
316	6	7.21	0.20	4.7	Bay	31.30	41.4	6.62	0.16	1.45	3.04	2.36	2.06	0.35	0.00525	0.07682	4.74	0.0009
316	9	7.55	0.17	6.7	Sea	20.60	32.2	7.46	0.02	1.17	1.68	1.31	1.10	0.08	0.00333	0.04998	0.00	-0.0015
316	12	7.17	0.24	3.7	Bay	20.10	47.2	4.52	0.02	0.97	1.40	1.06	1.00	0.05	0.00290	0.03405	0.00	-0.0030
316	15	6.77	0.43	5.1	Bay	31.20	41.8	16.70	0.38	2.05	5.84	5.35	2.64	1.34	0.00903	0.15250	11.25	0.0077
316	18	7.03	0.32	4.4	Bay	19.10	5.8	9.77	0.02	1.36	2.02	1.71	1.08	0.12	0.00376	0.06687	0.00	-0.0000
316	21	7.44	0.39	4.1	Bay	16.30	80.7	9.65	0.02	1.06	1.69	1.61	0.90	0.11	0.00363	0.04073	0.00	-0.0024
317	0	7.18	0.53	5.1	Bay	12.00	9.8	19.35	0.46	1.78	6.25	6.14	1.19	2.69	0.01285	0.11509	13.80	0.0043
317	3	6.79	0.53	4.7	Bay	24.70	88.7	18.82	0.42	1.69	6.01	5.97	2.19	1.66	0.01000	0.10443	12.67	0.0034
317	6	7.11	0.33	4.1	Bay	17.40	5.3	8.73	0.02	1.24	1.86	1.58	0.98	0.12	0.00372	0.05590	0.00	-0.0010
317	9	7.59	0.27	4.7	Bay	29.40	51.8	8.43	0.20	1.46	3.39	2.90	2.06	0.50	0.00600	0.07721	6.03	0.0009
317	12	7.36	0.22	4.4	Bay	32.70	75.4	6.43	0.02	1.33	1.83	1.34	1.55	0.03	0.00262	0.06436	0.00	-0.0002
317	15	6.79	0.18	4.1	Bay	20.60	3.6	5.15	0.02	1.09	1.56	1.15	1.06	0.06	0.00308	0.04292	0.00	-0.0022
317	18	6.93	0.15	8.5	Sea	13.70	80.2	8.03	0.02	0.83	1.27	1.19	0.75	0.11	0.00358	0.02526	0.00	-0.0038
317	21	7.40	0.21	6.1	Sea	28.30	32.3	8.99	0.27	1.51	3.69	3.10	2.13	0.74	0.00698	0.08332	8.15	0.0015
318	0	7.27	0.32	4.7	Bay	27.10	80.9	10.51	0.02	1.32	1.95	1.73	1.39	0.06	0.00306	0.06373	0.00	-0.0003
318	3	6.80	0.22	5.6	Bay	15.40	4.2	9.37	0.02	1.19	1.78	1.54	0.89	0.15	0.00398	0.05186	0.00	-0.0014
318	6	6.92	0.24	5.1	Bay	23.10	89.2	9.27	0.02	1.09	1.64	1.51	1.17	0.06	0.00302	0.04349	0.00	-0.0021
318	9	7.44	0.32	5.1	Bay	21.50	21.6	11.49	0.29	1.51	4.18	3.82	1.74	1.08	0.00819	0.08274	8.76	0.0014
318	12	7.41	0.30	5.6	Bay	31.40	84.9	11.76	0.33	1.44	4.07	3.87	2.40	0.80	0.00723	0.07585	9.91	0.0008
318	15	6.87	0.24	8.5	Sea	22.90	10.9	12.50	0.52	1.57	4.65	4.17	2.08	1.83	0.01050	0.09001	15.60	0.0021
318	18	6.79	0.20	6.7	Sea	25.60	75.7	9.34	0.02	1.23	1.77	1.49	1.30	0.06	0.00302	0.05519	0.00	-0.0011
318	21	7.20	0.36	6.1	Sea	22.50	41.4	15.32	0.44	1.70	5.28	4.97	2.02	1.75	0.01027	0.10489	13.26	0.0034
319	0	7.27	0.30	6.1	Sea	7.30	39.0	12.67	0.02	1.17	1.85	1.79	0.50	0.44	0.00571	0.04952	0.00	-0.0016
319	3	6.87	0.17	6.7	Sea	16.50	23.5	8.31	0.02	1.12	1.64	1.37	0.93	0.12	0.00372	0.04562	0.00	-0.0019
319	6	6.84	0.18	6.1	Sea	27.50	85.4	8.09	0.02	1.16	1.65	1.38	1.34	0.04	0.00275	0.04927	0.00	-0.0016
319	9	7.35	0.25	6.1	Sea	21.80	5.5	10.70	0.33	1.47	4.02	3.60	1.79	1.15	0.00842	0.07810	9.82	0.0010
319	12	7.48	0.20	7.5	Sea	26.60	81.9	9.44	0.02	1.21	1.72	1.47	1.33	0.05	0.00292	0.05341	0.00	-0.0012
319	15	7.03	0.19	7.5	Sea	26.30	66.2	9.23	0.02	1.30	1.84	1.48	1.35	0.06	0.00307	0.06123	0.00	-0.0005
319	18	6.78	0.20	7.5	Sea	15.20	43.6	9.97	0.02	1.14	1.69	1.50	0.88	0.15	0.00401	0.04691	0.00	-0.0018

319	21	7.07	0.25	6.7	Sea	11.90	38.2	11.47	0.02	1.17	1.80	1.67	0.74	0.25	0.00465	0.05017	0.00	-0.0015
320	0	7.29	0.24	8.5	Sea	13.20	37.7	12.27	0.02	1.23	1.84	1.68	0.82	0.24	0.00465	0.05509	0.00	-0.0011
320	3	6.93	0.20	8.5	Sea	11.30	13.5	10.41	0.02	1.10	1.64	1.49	0.71	0.25	0.00467	0.04363	0.00	-0.0021
320	6	6.70	0.10	6.1	Sea	24.30	38.3	4.48	0.02	1.10	1.51	0.99	1.19	0.04	0.00281	0.04374	0.00	-0.0021
320	9	7.05	0.19	6.7	Sea	29.30	55.8	8.66	0.30	1.42	3.50	2.98	2.19	0.71	0.00686	0.07344	8.89	0.0006
320	12	7.40	0.25	6.7	Sea	13.40	2.6	11.25	0.02	1.24	1.86	1.67	0.82	0.22	0.00450	0.05599	0.00	-0.0010
320	15	7.12	0.20	6.7	Sea	17.10	62.1	9.01	0.02	1.07	1.59	1.42	0.94	0.11	0.00358	0.04156	0.00	-0.0023
320	18	6.73	0.16	8.5	Sea	20.10	24.5	8.34	0.02	1.21	1.72	1.35	1.10	0.10	0.00350	0.05334	0.00	-0.0012
320	21	6.89	0.18	7.5	Sea	17.90	77.0	8.96	0.02	1.00	1.50	1.36	0.96	0.09	0.00338	0.03663	0.00	-0.0027
321	0	7.29	0.23	8.5	Sea	19.60	11.6	11.42	0.50	1.40	4.22	3.84	1.77	1.81	0.01043	0.07181	14.91	0.0004
321	3	7.12	0.20	7.5	Sea	22.20	62.5	9.93	0.02	1.24	1.80	1.53	1.19	0.08	0.00336	0.05619	0.00	-0.0010
321	6	6.74	0.16	8.5	Sea	15.40	4.1	8.28	0.02	1.08	1.57	1.30	0.88	0.13	0.00385	0.04266	0.00	-0.0022
321	9	6.89	0.20	7.5	Sea	9.50	65.4	9.76	0.02	0.93	1.47	1.41	0.59	0.24	0.00464	0.03167	0.00	-0.0032
321	12	7.36	0.24	7.5	Sea	20.30	28.6	11.46	0.44	1.41	4.19	3.84	1.78	1.57	0.00975	0.07253	13.18	0.0005
321	15	7.28	0.22	6.1	Sea	30.20	89.4	9.33	0.02	1.26	1.78	1.52	1.46	0.04	0.00273	0.05760	0.00	-0.0008
321	18	6.83	0.18	8.5	Sea	13.30	8.6	9.67	0.02	1.11	1.64	1.43	0.80	0.19	0.00428	0.04465	0.00	-0.0020
321	21	6.77	0.17	7.5	Sea	16.90	64.1	8.37	0.02	1.01	1.49	1.31	0.92	0.10	0.00349	0.03689	0.00	-0.0027
322	0	7.23	0.29	4.7	Bay	15.60	2.1	9.58	0.02	1.23	1.86	1.62	0.90	0.15	0.00398	0.05523	0.00	-0.0011
322	3	7.22	0.26	7.5	Sea	26.30	82.2	12.53	0.02	1.35	1.97	1.77	1.38	0.07	0.00322	0.06657	0.00	-0.0000
322	6	6.79	0.23	8.5	Sea	17.30	20.6	11.96	0.53	1.36	4.30	4.00	1.61	2.06	0.01115	0.06709	15.83	0.0000
322	9	6.70	0.24	3.5	Bay	26.00	11.3	4.38	0.02	1.21	1.70	1.12	1.28	0.05	0.00283	0.05350	0.00	-0.0012
322	12	7.25	0.30	3.7	Bay	30.50	37.1	5.71	0.11	1.40	2.73	2.07	1.88	0.23	0.00456	0.07137	3.20	0.0004
322	15	7.37	0.42	4.7	Bay	2.40	59.2	13.57	0.02	1.20	1.98	1.98	0.18	0.81	0.00725	0.05199	0.00	-0.0014
322	18	7.11	0.18	6.7	Sea	4.00	85.6	8.41	0.02	0.76	1.27	1.26	0.27	0.45	0.00574	0.02090	0.00	-0.0041
322	21	6.78	0.10	8.5	Sea	25.90	70.0	5.09	0.02	1.06	1.44	0.99	1.24	0.03	0.00264	0.04113	0.00	-0.0023
323	0	7.26	0.23	5.1	Bay	22.10	27.5	8.20	0.02	1.30	1.88	1.49	1.18	0.09	0.00337	0.06128	0.00	-0.0005
323	3	7.52	0.31	3.9	Bay	15.40	70.0	6.50	0.02	0.88	1.38	1.25	0.82	0.08	0.00330	0.02844	0.00	-0.0035
323	6	7.22	0.92	5.1	Bay	13.50	51.9	33.72	0.40	2.66	8.71	8.63	1.45	3.65	0.01533	0.25690	10.90	0.0171
323	9	6.83	0.56	4.1	Bay	24.10	66.1	15.83	0.31	1.70	5.26	5.08	2.00	1.21	0.00861	0.10509	9.27	0.0034
323	12	7.07	0.28	4.7	Bay	18.90	37.6	9.67	0.02	1.28	1.91	1.65	1.06	0.12	0.00369	0.05986	0.00	-0.0006
323	15	7.40	0.23	4.1	Bay	23.20	50.9	5.71	0.02	1.12	1.60	1.22	1.16	0.05	0.00293	0.04557	0.00	-0.0019
323	18	7.12	0.18	6.7	Sea	21.10	61.2	8.41	0.02	1.14	1.65	1.38	1.11	0.08	0.00325	0.04743	0.00	-0.0018
323	21	6.65	0.10	8.5	Sea	27.80	27.5	5.27	0.02	1.27	1.72	1.07	1.37	0.05	0.00285	0.05832	0.00	-0.0008
324	0	6.92	0.13	8.5	Sea	22.50	53.7	6.89	0.02	1.11	1.56	1.19	1.15	0.06	0.00305	0.04516	0.00	-0.0020
324	3	7.41	0.18	7.5	Sea	25.10	24.8	8.37	0.33	1.38	3.48	2.91	1.96	0.90	0.00757	0.06908	9.72	0.0002
324	6	7.30	0.15	8.5	Sea	22.10	73.7	7.41	0.02	1.04	1.47	1.20	1.11	0.05	0.00296	0.03908	0.00	-0.0025
324	9	6.80	0.24	4.1	Bay	19.10	2.2	6.83	0.02	1.16	1.70	1.36	1.02	0.09	0.00337	0.04878	0.00	-0.0016
324	12	6.85	0.24	4.7	Bay	16.60	89.8	8.41	0.02	0.92	1.45	1.40	0.88	0.08	0.00334	0.03060	0.00	-0.0033
324	15	7.34	0.27	4.7	Bay	20.20	21.3	8.89	0.02	1.31	1.92	1.58	1.11	0.10	0.00356	0.06196	0.00	-0.0005
324	18	7.34	0.25	4.4	Bay	21.60	80.0	7.18	0.02	1.02	1.51	1.33	1.09	0.05	0.00296	0.03774	0.00	-0.0026
324	21	6.76	0.18	5.1	Bay	21.70	8.4	6.99	0.02	1.23	1.77	1.35	1.15	0.08	0.00328	0.05518	0.00	-0.0011
325	0	6.82	0.15	4.7	Bay	16.50	84.4	5.22	0.02	0.75	1.14	1.02	0.82	0.05	0.00290	0.02073	0.00	-0.0042
325	3	7.38	0.25	4.1	Bay	26.90	17.3	6.19	0.02	1.35	1.91	1.35	1.36	0.06	0.00301	0.06630	0.00	-0.0001
325	6	7.46	0.31	5.6	Bay	30.90	79.9	11.95	0.33	1.49	4.17	3.94	2.39	0.85	0.00739	0.08031	9.96	0.0012
325	9	6.85	0.23	6.1	Sea	18.30	24.5	10.50	0.02	1.32	1.95	1.66	1.05	0.14	0.00389	0.06376	0.00	-0.0003
325	12	6.60	0.23	6.1	Sea	19.20	72.5	10.60	0.02	1.17	1.77	1.62	1.06	0.10	0.00356	0.05013	0.00	-0.0015
325	15	7.03	0.36	6.1	Sea	21.30	14.5	15.81	0.45	1.77	5.46	5.11	1.95	1.90	0.01071	0.11366	13.46	0.0042
325	18	7.19	0.40	7.5	Sea	29.40	74.1	19.14	0.66	1.85	6.32	6.08	2.80	2.26	0.01172	0.12393	19.78	0.0051
325	21	6.60	0.31	7.5	Sea	23.90	6.6	15.85	0.55	1.83	5.62	5.15	2.25	2.16	0.01142	0.12138	16.45	0.0049
326	0	6.44	0.17	7.5	Bay	36.20	84.1	8.66	0.33	1.44	3.40	2.96	2.60	0.57	0.00629	0.07523	9.89	0.0007
326	3	7.02	0.32	8.5	Sea	31.00	47.8	16.18	0.62	1.91	5.80	5.25	2.87	2.01	0.01100	0.13236	18.69	0.0059
326	6	7.43	0.30	8.5	Sea	20.90	5.6	14.64	0.60	1.65	5.21	4.80	2.02	2.37	0.01201	0.09862	17.94	0.0028
326	9	7.05	0.29	4.1	Bay	21.90	64.6	7.79	0.02	1.15	1.71	1.45	1.14	0.07	0.00314	0.04814	0.00	-0.0017
326	12	6.64	0.28	4.1	Bay	36.00	63.0	8.40	0.17	1.60	3.46	2.88	2.38	0.36	0.00529	0.09365	5.03	0.0024
326	15	6.96	0.45	3.9	Bay	26.30	70.8	10.72	0.21	1.41	3.78	3.56	1.92	0.62	0.00651	0.07246	6.36	0.0005
326	18	7.36	0.56	4.7	Bay	15.90	85.5	18.24	0.42	1.58	5.85	5.83	1.48	2.06	0.01116	0.09096	12.62	0.0022
326	21	6.96	0.41	4.4	Bay	19.40	69.0	12.70	0.29	1.37	4.30	4.18	1.58	1.11	0.00829	0.06846	8.66	0.0001
327	0	6.50	0.35	4.7	Bay	31.40	83.6	13.02	0.31	1.54	4.42	4.24	2.41	0.82	0.00727	0.08580	9.11	0.0017
327	3	6.90	0.33	4.4	Bay	20.60	37.2	10.39	0.24	1.39	3.77	3.48	1.59	0.84	0.00736	0.07006	7.05	0.0003
327	6	7.51	0.25	4.7	Bay	33.00	50.5	7.94	0.19	1.55	3.39	2.76	2.24	0.42	0.00561	0.08695	5.55	0.0018

327	9	7.29	0.35	3.9	Bay	24.20	41.7	7.71	0.02	1.31	1.91	1.52	1.26	0.07	0.00318	0.06273	0.00	-0.0004
327	12	6.58	0.33	4.7	Bay	27.20	32.9	12.21	0.27	1.70	4.50	4.04	2.13	0.92	0.00764	0.10550	8.20	0.0035
327	15	6.60	0.17	4.1	Bay	24.90	36.6	4.95	0.02	1.17	1.64	1.14	1.23	0.05	0.00286	0.04957	0.00	-0.0016
327	18	7.24	0.16	7.5	Sea	30.60	25.4	7.60	0.29	1.51	3.48	2.70	2.26	0.67	0.00673	0.08255	8.52	0.0014
327	21	7.10	0.17	6.7	Sea	21.60	73.0	7.78	0.02	1.06	1.53	1.30	1.10	0.06	0.00305	0.04089	0.00	-0.0023
328	0	6.53	0.11	9.8	Sea	20.90	10.0	6.35	0.02	1.12	1.56	1.12	1.10	0.07	0.00322	0.04580	0.00	-0.0019
328	3	6.75	0.15	7.5	Sea	25.30	89.7	7.83	0.02	1.05	1.48	1.27	1.22	0.04	0.00272	0.04015	0.00	-0.0024
328	6	7.50	0.16	4.1	Bay	27.10	16.3	3.92	0.02	1.20	1.66	1.02	1.32	0.04	0.00275	0.05276	0.00	-0.0013
328	9	7.50	0.20	4.1	Bay	34.80	31.4	4.90	0.10	1.50	2.74	1.85	2.09	0.19	0.00429	0.08173	3.02	0.0013
328	12	6.86	0.23	4.1	Bay	14.80	16.3	6.43	0.02	0.99	1.50	1.26	0.81	0.10	0.00354	0.03567	0.00	-0.0028
328	15	6.72	0.25	3.7	Bay	22.60	39.8	5.55	0.02	1.13	1.63	1.23	1.14	0.06	0.00299	0.04665	0.00	-0.0018
328	18	7.33	0.28	3.7	Bay	28.00	11.4	5.14	0.02	1.33	1.86	1.24	1.39	0.05	0.00288	0.06415	0.00	-0.0003
328	21	7.40	0.30	5.1	Bay	25.80	82.2	10.88	0.02	1.29	1.92	1.73	1.33	0.07	0.00313	0.06097	0.00	-0.0005
329	0	6.94	0.53	3.9	Bay	22.50	22.3	12.82	0.24	1.66	4.53	4.20	1.77	0.93	0.00770	0.10029	7.12	0.0030
329	3	6.89	0.74	4.7	Bay	21.70	88.0	26.06	0.54	2.12	8.05	8.03	2.16	2.69	0.01286	0.16389	16.03	0.0087
329	6	7.58	0.70	5.1	Bay	28.60	5.2	24.22	0.35	2.55	7.25	6.77	2.61	1.86	0.01060	0.23606	9.68	0.0152
329	9	7.88	0.86	6.1	Bay	23.80	22.1	34.28	0.31	2.95	8.16	7.83	2.36	2.65	0.01276	0.31600	7.87	0.0224
329	12	7.23	1.08	6.1	Bay	28.80	20.6	46.44	0.20	3.79	9.08	8.68	2.78	2.37	0.01201	0.52289	3.03	0.0410
329	15	6.85	0.55	4.7	Bay	26.80	53.9	19.30	0.40	2.03	6.38	6.09	2.38	1.66	0.01001	0.15031	12.08	0.0075
329	18	7.25	0.35	7.5	Sea	18.50	29.4	16.72	0.60	1.68	5.67	5.40	1.84	2.66	0.01278	0.10315	17.92	0.0033
329	21	7.50	0.31	7.5	Sea	20.80	51.0	14.40	0.54	1.53	4.98	4.71	1.94	2.04	0.01109	0.08476	16.05	0.0016
330	0	7.07	0.26	8.5	Sea	17.90	52.3	13.49	0.59	1.38	4.67	4.46	1.72	2.31	0.01183	0.06906	17.75	0.0002
330	3	6.77	0.19	3.9	Bay	26.50	49.0	4.67	0.02	1.17	1.63	1.12	1.29	0.04	0.00275	0.04977	0.00	-0.0016
330	6	7.31	0.21	8.5	Sea	24.90	1.1	10.55	0.45	1.52	4.17	3.59	2.13	1.39	0.00919	0.08435	13.34	0.0016
330	9	7.76	0.21	8.5	Sea	32.50	46.7	9.90	0.41	1.61	4.11	3.40	2.59	0.99	0.00789	0.09485	12.23	0.0025
330	12	7.32	0.19	9.8	Sea	13.30	88.5	9.77	0.02	0.88	1.36	1.32	0.76	0.13	0.00384	0.02809	0.00	-0.0035
330	15	6.76	0.13	11.6	Sea	20.90	15.7	7.41	0.02	1.17	1.63	1.20	1.12	0.08	0.00336	0.04999	0.00	-0.0015
330	18	7.03	0.16	8.5	Sea	8.00	89.4	8.11	0.02	0.72	1.17	1.16	0.49	0.22	0.00447	0.01908	0.00	-0.0043
330	21	7.47	0.15	11.6	Sea	22.30	7.6	8.22	0.02	1.27	1.77	1.30	1.20	0.09	0.00341	0.05890	0.00	-0.0007
331	0	7.13	0.19	11.6	Sea	14.40	63.0	10.29	0.02	1.03	1.52	1.38	0.84	0.16	0.00402	0.03837	0.00	-0.0026
331	3	6.69	0.09	9.8	Sea	27.50	43.1	5.05	0.02	1.20	1.62	1.01	1.34	0.04	0.00277	0.05260	0.00	-0.0013
331	6	7.03	0.13	7.5	Sea	14.10	58.1	6.29	0.02	0.83	1.23	1.06	0.76	0.09	0.00341	0.02507	0.00	-0.0038
331	9	7.59	0.13	9.8	Sea	21.10	1.6	6.40	0.02	1.14	1.58	1.13	1.11	0.07	0.00323	0.04688	0.00	-0.0018
331	12	7.36	0.13	8.5	Sea	14.30	89.7	6.57	0.02	0.72	1.09	1.02	0.74	0.07	0.00316	0.01871	0.00	-0.0043
331	15	6.82	0.10	11.6	Sea	17.50	20.0	5.64	0.02	0.95	1.33	0.97	0.92	0.08	0.00326	0.03294	0.00	-0.0031
331	18	6.90	0.12	8.5	Sea	10.70	55.8	6.18	0.02	0.73	1.11	1.00	0.60	0.12	0.00375	0.01961	0.00	-0.0043
331	21	7.36	0.13	11.6	Sea	18.10	18.2	7.06	0.02	1.06	1.49	1.13	0.98	0.09	0.00345	0.04079	0.00	-0.0024
332	0	7.23	0.14	11.6	Sea	12.20	79.6	7.56	0.02	0.75	1.14	1.06	0.68	0.11	0.00365	0.02070	0.00	-0.0042
332	3	6.73	0.12	14.2	Sea	20.40	2.9	6.80	0.02	1.12	1.54	1.10	1.08	0.08	0.00331	0.04539	0.00	-0.0019
332	6	6.85	0.18	4.4	Bay	14.90	65.7	5.63	0.02	0.82	1.25	1.10	0.78	0.07	0.00321	0.02448	0.00	-0.0038
332	9	7.38	0.22	4.1	Bay	21.60	4.6	5.56	0.02	1.15	1.65	1.21	1.11	0.06	0.00310	0.04783	0.00	-0.0017
332	12	7.35	0.17	3.7	Bay	30.00	89.6	3.16	0.02	1.07	1.41	0.89	1.35	0.02	0.00235	0.04171	0.00	-0.0023
332	15	6.85	0.19	4.7	Bay	17.70	27.1	6.75	0.02	1.07	1.58	1.29	0.95	0.09	0.00340	0.04201	0.00	-0.0022
332	18	6.73	0.24	3.7	Bay	23.00	63.2	5.31	0.02	1.05	1.51	1.18	1.13	0.04	0.00283	0.04007	0.00	-0.0024
332	21	7.10	0.39	4.4	Bay	16.00	50.1	11.82	0.02	1.32	2.05	1.89	0.94	0.17	0.00413	0.06353	0.00	-0.0003
333	0	7.14	0.28	4.7	Bay	11.60	28.4	9.29	0.02	1.08	1.68	1.55	0.70	0.19	0.00429	0.04226	0.00	-0.0022
333	3	6.71	0.21	8.5	Sea	8.10	36.8	11.05	0.02	1.03	1.59	1.51	0.54	0.37	0.00535	0.03864	0.00	-0.0026
333	6	6.72	0.18	5.6	Bay	26.60	88.4	7.72	0.02	1.11	1.58	1.34	1.29	0.04	0.00272	0.04461	0.00	-0.0020
333	9	7.18	0.28	7.5	Sea	17.00	65.1	13.64	0.02	1.33	2.00	1.86	1.01	0.18	0.00421	0.06391	0.00	-0.0003
333	12	7.38	0.23	7.5	Sea	3.10	65.5	10.96	0.02	0.93	1.52	1.51	0.23	0.74	0.00698	0.03171	0.00	-0.0032
333	15	7.03	0.41	4.4	Bay	30.40	40.6	12.47	0.26	1.79	4.61	4.11	2.33	0.81	0.00723	0.11677	7.64	0.0045
333	18	6.66	0.16	4.4	Bay	29.80	62.2	5.15	0.02	1.25	1.71	1.17	1.43	0.04	0.00266	0.05654	0.00	-0.0009
333	21	6.96	0.19	9.8	Sea	12.10	61.9	9.96	0.02	0.98	1.48	1.37	0.73	0.19	0.00428	0.03471	0.00	-0.0029
334	0	7.20	0.21	9.8	Sea	13.50	26.3	10.86	0.02	1.16	1.70	1.51	0.82	0.21	0.00444	0.04863	0.00	-0.0017
334	3	6.99	0.21	3.7	Bay	5.10	22.0	4.24	0.02	0.56	0.95	0.91	0.30	0.16	0.00408	0.01140	0.00	-0.0050
334	6	6.73	0.13	3.9	Bay	18.20	54.5	3.40	0.02	0.82	1.16	0.86	0.89	0.04	0.00276	0.02417	0.00	-0.0039
334	9	7.04	0.17	9.8	Sea	12.60	36.6	9.10	0.02	1.00	1.48	1.31	0.75	0.18	0.00420	0.03653	0.00	-0.0027
334	12	7.33	0.20	8.5	Sea	17.40	48.7	9.73	0.02	1.15	1.68	1.45	0.98	0.12	0.00375	0.04824	0.00	-0.0017
334	15	7.08	0.17	9.8	Sea	19.60	70.9	9.01	0.02	1.06	1.53	1.32	1.04	0.08	0.00331	0.04072	0.00	-0.0024
334	18	6.69	0.16	8.5	Sea	17.50	3.5	8.48	0.02	1.16	1.67	1.35	0.98	0.12	0.00372	0.04899	0.00	-0.0016

334	21	6.78	0.15	14.2	Sea	7.10	64.2	8.72	0.02	0.76	1.17	1.12	0.46	0.32	0.00510	0.02109	0.00	-0.0041
335	0	7.11	0.14	8.5	Sea	17.90	3.8	6.98	0.02	1.08	1.53	1.19	0.97	0.09	0.00347	0.04222	0.00	-0.0022
335	3	6.96	0.13	14.2	Sea	6.60	58.3	7.58	0.02	0.69	1.06	1.01	0.42	0.30	0.00496	0.01735	0.00	-0.0045
335	6	6.65	0.12	9.8	Sea	10.20	1.6	6.44	0.02	0.80	1.18	1.02	0.60	0.16	0.00405	0.02306	0.00	-0.0040
335	9	6.79	0.15	7.5	Sea	5.70	53.5	7.75	0.02	0.75	1.21	1.17	0.37	0.32	0.00511	0.02050	0.00	-0.0042
335	12	7.12	0.13	6.1	Sea	17.90	21.9	5.69	0.02	1.00	1.44	1.10	0.94	0.07	0.00324	0.03635	0.00	-0.0028
335	15	7.03	0.12	7.5	Bay	25.80	81.0	5.99	0.02	1.05	1.44	1.10	1.23	0.03	0.00264	0.03989	0.00	-0.0024
335	18	6.70	0.12	14.2	Sea	15.50	33.4	6.93	0.02	0.93	1.32	1.04	0.85	0.10	0.00355	0.03177	0.00	-0.0032
335	21	6.70	0.11	11.6	Sea	10.00	72.7	6.15	0.02	0.65	0.98	0.91	0.56	0.12	0.00371	0.01535	0.00	-0.0046

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8812

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day Jln	time hour	depth m	H cm	T sec	srce --	Uc cm/s	Phi deg	Ub cm/s	Zo cm	u*s cm/s	u*t cm/s	u*wm cm/s	u*c cm/s	Z'o cm	Cd --	Shlds ---	Kbr cm	C* cm
336	0	7.06	0.15	14.2	Sea	17.50	25.9	8.64	0.02	1.11	1.56	1.24	0.98	0.12	0.00371	0.04485	0.00	-0.0020
336	3	7.09	0.15	11.6	Sea	6.60	45.4	7.98	0.02	0.75	1.16	1.10	0.43	0.32	0.00508	0.02058	0.00	-0.0042
336	6	6.89	0.13	11.6	Sea	18.70	40.1	6.94	0.02	1.03	1.44	1.11	0.99	0.08	0.00331	0.03847	0.00	-0.0026
336	9	6.90	0.12	11.6	Sea	10.10	79.4	6.55	0.02	0.65	1.00	0.94	0.57	0.12	0.00374	0.01559	0.00	-0.0046
336	12	7.22	0.14	11.6	Sea	16.40	19.6	7.35	0.02	1.02	1.45	1.14	0.91	0.11	0.00360	0.03798	0.00	-0.0026
336	15	7.28	0.13	11.6	Sea	18.40	51.4	6.73	0.02	0.97	1.37	1.07	0.96	0.07	0.00322	0.03445	0.00	-0.0029
336	18	6.97	0.13	14.2	Sea	13.40	61.9	7.24	0.02	0.81	1.18	1.02	0.74	0.11	0.00360	0.02416	0.00	-0.0039
336	21	6.80	0.12	11.6	Sea	11.50	34.1	6.49	0.02	0.80	1.17	0.99	0.66	0.13	0.00384	0.02327	0.00	-0.0039
337	0	7.22	0.13	9.8	Sea	17.10	25.9	6.65	0.02	1.00	1.42	1.11	0.92	0.09	0.00342	0.03651	0.00	-0.0027
337	3	7.44	0.48	4.4	Bay	7.40	8.1	13.77	0.02	1.32	2.12	2.06	0.51	0.44	0.00570	0.06348	0.00	-0.0003
337	6	7.13	0.60	5.6	Bay	19.90	32.7	24.24	0.57	2.23	7.74	7.51	2.04	3.03	0.01374	0.18140	17.16	0.0103
337	9	6.95	0.45	4.1	Bay	25.00	69.3	12.46	0.26	1.49	4.28	4.09	1.93	0.85	0.00739	0.08049	7.70	0.0012
337	12	7.10	0.24	4.4	Bay	7.90	54.9	7.24	0.02	0.81	1.33	1.28	0.48	0.20	0.00433	0.02381	0.00	-0.0039
337	15	7.26	0.22	8.5	Sea	14.20	26.2	10.95	0.02	1.20	1.77	1.57	0.86	0.20	0.00435	0.05208	0.00	-0.0013
337	18	6.95	0.10	14.2	Sea	19.50	61.9	5.55	0.02	0.90	1.24	0.91	0.97	0.05	0.00291	0.02941	0.00	-0.0034
337	21	6.67	0.08	4.1	Bay	19.30	17.6	2.38	0.02	0.84	1.16	0.71	0.93	0.04	0.00269	0.02556	0.00	-0.0037
338	0	6.79	0.08	2.8	Bay	5.20	68.7	0.55	0.02	0.21	0.32	0.25	0.24	0.03	0.00251	0.00163	0.00	-0.0059
338	3	7.14	0.07	11.6	Sea	17.20	4.7	3.81	0.02	0.84	1.15	0.76	0.87	0.06	0.00299	0.02556	0.00	-0.0037
338	6	7.03	0.07	11.6	Sea	5.50	64.6	4.12	0.02	0.44	0.70	0.66	0.32	0.16	0.00407	0.00717	0.00	-0.0054
338	9	6.70	0.05	11.6	Sea	12.80	10.6	2.93	0.02	0.64	0.89	0.61	0.65	0.06	0.00301	0.01474	0.00	-0.0047
338	12	6.77	0.07	11.6	Sea	6.70	89.8	3.81	0.02	0.40	0.63	0.62	0.36	0.10	0.00349	0.00574	0.00	-0.0055
338	15	7.03	0.06	9.8	Sea	14.50	13.1	3.35	0.02	0.72	1.01	0.70	0.74	0.06	0.00301	0.01902	0.00	-0.0043
338	18	6.94	0.08	6.7	Bay	13.00	82.4	3.77	0.02	0.58	0.85	0.74	0.64	0.05	0.00283	0.01218	0.00	-0.0049
338	21	6.55	0.07	11.6	Sea	14.20	7.8	3.77	0.02	0.74	1.03	0.72	0.73	0.06	0.00312	0.01977	0.00	-0.0043
339	0	6.62	0.07	18.3	Sea	7.30	82.5	4.32	0.02	0.44	0.66	0.62	0.40	0.10	0.00356	0.00689	0.00	-0.0054
339	3	7.10	0.07	4.4	Bay	20.30	16.2	2.09	0.02	0.85	1.16	0.66	0.96	0.03	0.00262	0.02628	0.00	-0.0037
339	6	7.18	0.11	3.3	Bay	8.30	41.5	1.37	0.02	0.39	0.59	0.46	0.40	0.04	0.00277	0.00561	0.00	-0.0055
339	9	7.03	1.15	5.6	Bay	27.80	64.9	46.87	0.21	3.58	9.13	8.94	2.68	2.36	0.01198	0.46593	3.72	0.0359
339	12	6.93	0.71	4.7	Bay	16.70	86.4	24.80	0.52	2.01	7.71	7.69	1.69	2.88	0.01336	0.14766	15.57	0.0073
339	15	7.22	0.38	5.6	Bay	16.60	87.6	15.09	0.02	1.34	2.12	2.08	0.99	0.19	0.00427	0.06502	0.00	-0.0002
339	18	7.20	0.22	4.7	Bay	16.80	47.0	7.37	0.02	1.04	1.56	1.34	0.91	0.09	0.00346	0.03953	0.00	-0.0025
339	21	6.81	0.23	8.5	Sea	14.90	73.6	11.99	0.02	1.13	1.71	1.62	0.88	0.17	0.00415	0.04621	0.00	-0.0019
340	0	6.69	0.15	7.5	Sea	2.80	66.8	7.57	0.02	0.69	1.14	1.14	0.20	0.54	0.00615	0.01728	0.00	-0.0045
340	3	7.15	0.13	6.7	Sea	18.70	11.1	6.03	0.02	1.05	1.50	1.13	0.99	0.08	0.00328	0.04029	0.00	-0.0024
340	6	7.26	0.10	8.5	Sea	14.60	0.9	4.92	0.02	0.84	1.20	0.91	0.78	0.08	0.00332	0.02564	0.00	-0.0037
340	9	6.91	0.12	8.5	Sea	7.70	83.6	6.02	0.02	0.59	0.96	0.94	0.45	0.16	0.00403	0.01281	0.00	-0.0049
340	12	6.70	0.09	7.5	Sea	7.90	72.2	4.42	0.02	0.52	0.83	0.78	0.44	0.11	0.00361	0.00994	0.00	-0.0051
340	15	6.93	0.15	4.4	Bay	3.10	31.6	4.57	0.02	0.53	0.92	0.90	0.19	0.25	0.00470	0.01010	0.00	-0.0051
340	18	7.10	0.09	6.1	Sea	5.80	1.5	3.79	0.02	0.51	0.82	0.74	0.33	0.15	0.00395	0.00950	0.00	-0.0052
340	21	6.76	0.08	8.5	Sea	10.70	9.8	4.21	0.02	0.67	0.98	0.79	0.58	0.09	0.00346	0.01619	0.00	-0.0046
341	0	6.60	0.06	9.8	Sea	16.10	66.6	3.10	0.02	0.67	0.92	0.65	0.77	0.04	0.00267	0.01652	0.00	-0.0045
341	3	7.09	0.07	9.8	Sea	14.80	10.5	3.55	0.02	0.75	1.04	0.72	0.76	0.06	0.00304	0.02029	0.00	-0.0042
341	6	7.46	0.07	3.9	Bay	15.10	58.1	1.43	0.02	0.59	0.81	0.50	0.70	0.03	0.00250	0.01278	0.00	-0.0049
341	9	7.12	0.07	8.5	Sea	20.10	21.6	3.82	0.02	0.93	1.28	0.82	1.00	0.05	0.00287	0.03171	0.00	-0.0032
341	12	6.71	0.07	9.8	Sea	10.10	8.4	3.62	0.02	0.60	0.87	0.69	0.54	0.09	0.00337	0.01318	0.00	-0.0048
341	15	6.91	0.11	7.5	Sea	3.20	31.9	5.62	0.02	0.57	0.94	0.91	0.21	0.37	0.00535	0.01163	0.00	-0.0050
341	18	7.23	0.09	8.5	Sea	15.40	47.6	4.48	0.02	0.78	1.11	0.85	0.79	0.06	0.00306	0.02212	0.00	-0.0040
341	21	6.90	0.10	9.8	Sea	6.20	47.9	5.65	0.02	0.60	0.94	0.88	0.38	0.22	0.00447	0.01299	0.00	-0.0049
342	0	6.55	0.08	3.9	Bay	22.60	71.3	2.04	0.02	0.85	1.13	0.66	1.03	0.02	0.00242	0.02603	0.00	-0.0037
342	3	6.84	0.16	4.7	Bay	6.50	21.7	5.52	0.02	0.68	1.10	1.04	0.39	0.19	0.00426	0.01662	0.00	-0.0045

342	6	7.31	0.12	5.1	Bay	21.20	11.5	4.27	0.02	1.03	1.44	0.98	1.06	0.05	0.00293	0.03850	0.00	-0.0026
342	9	7.07	0.10	3.3	Bay	17.80	69.4	1.30	0.02	0.66	0.89	0.50	0.81	0.02	0.00240	0.01592	0.00	-0.0046
342	12	6.58	0.07	4.7	Bay	17.10	30.4	2.55	0.02	0.76	1.07	0.70	0.83	0.04	0.00274	0.02113	0.00	-0.0041
342	15	6.69	0.08	5.1	Bay	6.80	44.4	3.05	0.02	0.47	0.74	0.67	0.37	0.09	0.00347	0.00787	0.00	-0.0053
342	18	7.17	0.11	4.7	Bay	15.00	11.7	3.75	0.02	0.80	1.16	0.87	0.77	0.06	0.00307	0.02307	0.00	-0.0040
342	21	7.02	0.11	9.8	Sea	5.80	73.7	5.65	0.02	0.55	0.89	0.86	0.35	0.22	0.00446	0.01106	0.00	-0.0050
343	0	6.57	0.08	4.7	Bay	13.30	35.7	2.93	0.02	0.66	0.96	0.72	0.67	0.05	0.00294	0.01584	0.00	-0.0046
343	3	6.81	0.08	11.6	Sea	8.80	3.4	4.64	0.02	0.62	0.92	0.77	0.50	0.13	0.00381	0.01420	0.00	-0.0048
343	6	7.41	0.11	4.7	Bay	20.50	1.3	3.60	0.02	0.97	1.35	0.89	1.02	0.05	0.00286	0.03400	0.00	-0.0030
343	9	7.41	0.09	3.3	Bay	14.70	73.5	0.99	0.02	0.54	0.72	0.41	0.67	0.02	0.00238	0.01058	0.00	-0.0051
343	14	6.67	0.31	3.9	Bay	27.50	2.6	7.93	0.15	1.50	3.33	2.75	1.88	0.43	0.00567	0.08235	4.58	0.0014
343	17	7.08	0.15	3.5	Bay	17.30	39.0	2.50	0.02	0.76	1.08	0.73	0.84	0.04	0.00271	0.02118	0.00	-0.0041
343	20	7.34	0.14	5.6	Bay	15.70	40.2	5.42	0.02	0.89	1.30	1.05	0.83	0.08	0.00326	0.02864	0.00	-0.0035
343	23	6.91	0.19	3.5	Bay	12.30	81.3	3.23	0.02	0.56	0.87	0.78	0.61	0.05	0.00284	0.01143	0.00	-0.0050
344	2	6.69	0.11	3.7	Bay	27.60	31.7	2.49	0.02	1.11	1.50	0.80	1.30	0.03	0.00255	0.04494	0.00	-0.0020
344	5	7.21	0.14	5.6	Bay	16.30	19.5	5.80	0.02	0.97	1.41	1.12	0.87	0.08	0.00335	0.03392	0.00	-0.0030
344	8	7.60	0.20	4.1	Bay	18.80	15.3	4.70	0.02	0.99	1.43	1.06	0.96	0.06	0.00307	0.03563	0.00	-0.0028
344	11	7.22	0.61	4.7	Bay	21.10	39.8	20.20	0.42	2.02	6.58	6.35	1.96	2.04	0.01109	0.14838	12.67	0.0073
344	14	6.72	0.38	4.1	Bay	30.60	60.5	11.07	0.22	1.61	4.06	3.67	2.23	0.62	0.00650	0.09416	6.63	0.0024
344	17	7.02	0.25	4.1	Bay	18.30	42.3	6.80	0.02	1.07	1.60	1.33	0.97	0.08	0.00332	0.04182	0.00	-0.0023
344	20	7.35	0.21	3.7	Bay	17.50	36.8	3.85	0.02	0.87	1.26	0.94	0.88	0.05	0.00293	0.02724	0.00	-0.0036
344	23	7.06	0.17	6.7	Bay	12.80	83.7	7.67	0.02	0.80	1.26	1.20	0.71	0.11	0.00360	0.02331	0.00	-0.0039
345	2	6.70	0.10	3.5	Bay	25.70	7.1	1.80	0.02	1.02	1.37	0.67	1.20	0.03	0.00252	0.03785	0.00	-0.0026
345	5	7.06	0.11	5.1	Bay	8.40	64.5	4.20	0.02	0.56	0.90	0.83	0.46	0.10	0.00352	0.01135	0.00	-0.0050
345	8	7.62	0.10	6.1	Sea	23.60	20.4	4.30	0.02	1.09	1.51	0.97	1.17	0.05	0.00285	0.04350	0.00	-0.0021
345	11	7.37	0.13	6.1	Bay	28.20	39.3	5.40	0.02	1.27	1.75	1.15	1.39	0.04	0.00282	0.05911	0.00	-0.0007
345	14	6.73	0.10	14.2	Sea	29.00	24.5	6.05	0.02	1.33	1.79	1.09	1.45	0.05	0.00290	0.06482	0.00	-0.0002
345	17	6.81	0.11	14.2	Sea	12.30	16.1	6.18	0.02	0.82	1.16	0.94	0.69	0.12	0.00375	0.02416	0.00	-0.0039
345	20	7.26	0.12	14.2	Sea	19.70	2.7	6.58	0.02	1.08	1.49	1.07	1.05	0.08	0.00331	0.04253	0.00	-0.0022
345	23	7.05	0.13	14.2	Sea	20.10	65.0	7.19	0.02	0.98	1.37	1.08	1.03	0.06	0.00307	0.03525	0.00	-0.0029
346	2	6.57	0.10	14.2	Sea	30.90	10.8	5.72	0.42	1.40	3.21	2.17	2.38	0.83	0.00731	0.07100	12.48	0.0004
346	5	6.76	0.11	14.2	Sea	23.20	36.2	6.32	0.02	1.14	1.55	1.06	1.18	0.06	0.00305	0.04688	0.00	-0.0018
346	8	7.56	0.22	11.6	Sea	26.00	72.4	11.37	0.02	1.32	1.86	1.56	1.36	0.07	0.00319	0.06365	0.00	-0.0003
346	11	7.57	0.68	6.1	Bay	6.90	8.6	28.14	0.74	2.19	8.69	8.65	0.83	5.46	0.01987	0.17407	22.01	0.0096
346	14	6.90	0.61	4.4	Bay	35.40	70.3	19.34	0.37	2.12	6.38	6.07	2.96	1.25	0.00876	0.16353	11.07	0.0087
346	17	6.87	0.50	5.1	Bay	27.00	11.0	19.34	0.42	2.19	6.57	6.11	2.45	1.81	0.01045	0.17463	12.69	0.0097
346	20	7.33	0.40	3.9	Bay	16.50	80.1	8.79	0.02	1.01	1.62	1.53	0.90	0.10	0.00349	0.03742	0.00	-0.0027
346	23	7.40	0.54	5.1	Bay	10.90	17.7	19.16	0.46	1.73	6.18	6.09	1.09	2.75	0.01301	0.10944	13.80	0.0038
347	2	6.93	0.65	4.7	Bay	26.20	81.2	22.50	0.47	2.01	7.10	7.01	2.43	2.01	0.01102	0.14671	14.15	0.0072
347	5	6.91	0.68	5.1	Bay	23.90	17.6	26.17	0.40	2.52	7.68	7.34	2.30	2.35	0.01195	0.23041	11.11	0.0147
347	8	7.47	0.60	5.1	Bay	24.50	69.0	21.23	0.48	1.98	6.81	6.65	2.30	2.10	0.01128	0.14301	14.49	0.0068
347	11	7.69	0.68	5.1	Bay	29.10	9.6	23.36	0.37	2.50	7.18	6.68	2.64	1.84	0.01052	0.22816	10.16	0.0145
347	14	7.08	0.58	4.1	Bay	21.40	47.8	15.55	0.30	1.72	5.22	5.00	1.80	1.29	0.00887	0.10755	9.07	0.0037
347	17	6.78	0.34	4.1	Bay	24.60	57.0	9.61	0.21	1.37	3.53	3.23	1.79	0.61	0.00647	0.06873	6.13	0.0002
347	20	7.13	0.23	7.5	Bay	16.60	49.1	11.28	0.02	1.24	1.84	1.64	0.97	0.16	0.00404	0.05563	0.00	-0.0010
347	23	7.39	0.23	7.5	Sea	26.20	41.0	11.09	0.41	1.53	4.22	3.73	2.19	1.24	0.00873	0.08460	12.37	0.0016
348	2	6.96	0.27	3.7	Bay	17.40	86.2	5.42	0.02	0.79	1.22	1.11	0.87	0.05	0.00289	0.02298	0.00	-0.0040
348	5	6.74	0.23	8.5	Sea	23.20	23.2	12.34	0.52	1.55	4.59	4.12	2.09	1.77	0.01034	0.08767	15.48	0.0019
348	8	7.21	0.23	9.8	Sea	20.40	47.9	12.22	0.62	1.37	4.40	4.09	1.92	2.13	0.01134	0.06821	18.61	0.0001
348	11	7.55	0.26	7.5	Bay	34.90	1.7	11.95	0.40	1.94	4.95	4.03	2.86	1.14	0.00840	0.13680	12.10	0.0063
348	14	7.08	0.17	9.8	Sea	20.40	49.6	9.17	0.02	1.19	1.69	1.38	1.11	0.09	0.00346	0.05124	0.00	-0.0014
348	17	6.69	0.14	8.5	Sea	33.70	12.2	7.26	0.30	1.60	3.61	2.63	2.49	0.67	0.00670	0.09339	8.99	0.0024
348	20	6.90	0.19	5.1	Bay	22.00	59.9	7.15	0.02	1.12	1.62	1.32	1.13	0.06	0.00308	0.04567	0.00	-0.0019
348	23	7.37	0.15	9.8	Sea	22.80	5.3	7.81	0.02	1.28	1.78	1.30	1.22	0.08	0.00334	0.05923	0.00	-0.0007
349	2	7.11	0.16	8.5	Sea	13.90	61.7	8.00	0.02	0.91	1.36	1.22	0.78	0.12	0.00370	0.03009	0.00	-0.0033
349	5	6.81	0.16	9.8	Sea	26.50	9.2	8.69	0.43	1.45	3.74	3.04	2.18	1.17	0.00848	0.07607	12.94	0.0008
349	8	7.03	0.16	9.8	Sea	23.30	88.8	8.73	0.02	1.03	1.46	1.28	1.16	0.05	0.00287	0.03836	0.00	-0.0026
349	11	7.52	0.16	9.8	Sea	28.30	30.8	8.02	0.40	1.43	3.56	2.84	2.25	0.97	0.00784	0.07408	12.02	0.0006
349	14	7.38	0.15	11.6	Sea	32.80	49.1	7.95	0.46	1.49	3.66	2.83	2.59	0.95	0.00775	0.08119	13.82	0.0013
349	17	6.86	0.16	9.8	Sea	13.10	65.1	8.86	0.02	0.92	1.38	1.26	0.75	0.14	0.00392	0.03077	0.00	-0.0033

349	20	6.81	0.15	9.8	Sea	13.50	31.0	8.25	0.02	0.98	1.44	1.24	0.78	0.15	0.00397	0.03528	0.00	-0.0029
349	23	7.23	0.18	9.8	Sea	19.70	18.9	9.53	0.02	1.27	1.80	1.44	1.10	0.12	0.00370	0.05863	0.00	-0.0008
350	2	7.21	0.18	5.1	Bay	23.00	88.0	6.53	0.02	0.97	1.39	1.20	1.12	0.04	0.00273	0.03391	0.00	-0.0030
350	5	6.72	0.30	14.2	Sea	28.20	3.2	17.07	1.09	1.95	6.37	5.59	3.05	3.72	0.01551	0.13891	32.56	0.0065
350	8	6.70	0.37	14.2	Sea	36.60	51.7	21.26	1.28	2.24	7.58	6.79	4.01	3.91	0.01600	0.18305	38.37	0.0104
350	11	7.23	0.49	14.2	Sea	19.90	63.3	26.98	1.68	2.05	8.63	8.42	2.69	7.80	0.02582	0.15314	50.47	0.0078
350	14	7.37	0.50	14.2	Sea	2.10	58.1	27.19	1.78	1.82	8.53	8.53	0.36	14.12	0.04387	0.12042	53.36	0.0048
350	17	6.94	0.45	18.3	Sea	29.60	26.5	25.76	1.73	2.38	8.66	7.85	3.83	6.81	0.02329	0.20681	51.18	0.0126
350	20	6.83	0.39	14.2	Sea	44.10	2.4	22.18	0.61	2.74	7.19	5.86	4.18	2.20	0.01153	0.27342	17.05	0.0186
350	23	7.33	0.56	14.2	Sea	20.90	56.1	30.68	1.82	2.31	9.72	9.45	2.95	8.84	0.02856	0.19491	54.69	0.0115
351	2	7.64	0.73	14.2	Sea	9.10	54.2	39.45	1.38	2.59	10.34	10.28	1.48	12.88	0.04002	0.24365	40.45	0.0159
351	5	7.23	0.72	5.1	Bay	22.60	55.4	26.38	0.55	2.35	8.23	8.04	2.28	2.85	0.01329	0.20116	15.73	0.0121
351	8	6.90	0.58	14.2	Sea	31.60	50.5	32.86	0.92	2.72	8.76	8.22	3.67	4.81	0.01826	0.26832	26.47	0.0181
351	11	7.19	0.44	11.6	Sea	15.80	52.9	23.68	1.25	1.88	7.63	7.46	2.00	6.35	0.02213	0.12821	37.57	0.0055
351	14	7.38	0.39	14.2	Sea	19.80	29.5	21.53	1.38	1.90	7.24	6.86	2.47	6.09	0.02147	0.13160	41.51	0.0058
351	17	7.04	0.31	14.2	Sea	22.60	46.8	17.54	1.18	1.69	6.11	5.70	2.55	4.34	0.01709	0.10404	35.45	0.0033
351	20	6.63	0.26	14.2	Sea	23.50	0.7	15.11	1.02	1.70	5.60	5.00	2.52	3.60	0.01521	0.10471	30.49	0.0034
351	23	6.96	0.21	14.2	Sea	8.70	1.5	12.11	0.02	1.08	1.60	1.48	0.60	0.44	0.00569	0.04238	0.00	-0.0022
352	2	7.52	0.17	14.2	Sea	30.90	44.1	9.11	0.64	1.50	4.01	3.20	2.67	1.45	0.00939	0.08205	19.30	0.0014
352	5	7.13	0.18	14.2	Sea	28.20	89.1	9.94	0.02	1.18	1.62	1.35	1.37	0.04	0.00275	0.05068	0.00	-0.0015
352	8	6.72	0.13	14.2	Sea	26.90	39.7	7.44	0.02	1.30	1.77	1.21	1.37	0.06	0.00303	0.06185	0.00	-0.0005
352	11	6.86	0.15	11.6	Sea	22.10	25.4	8.57	0.02	1.26	1.76	1.33	1.19	0.09	0.00342	0.05811	0.00	-0.0008
352	14	7.28	0.17	11.6	Sea	21.20	6.4	9.15	0.02	1.29	1.81	1.38	1.17	0.11	0.00359	0.06088	0.00	-0.0006
352	17	7.21	0.26	3.7	Bay	14.40	46.8	4.91	0.02	0.83	1.26	1.07	0.75	0.07	0.00322	0.02482	0.00	-0.0038
352	20	6.74	0.19	14.2	Sea	32.30	33.1	10.83	0.73	1.68	4.66	3.74	2.93	1.81	0.01046	0.10251	21.94	0.0032
352	23	6.91	0.19	8.5	Sea	18.70	52.0	9.86	0.02	1.18	1.72	1.47	1.04	0.11	0.00365	0.05081	0.00	-0.0015
353	2	7.47	0.28	3.9	Bay	17.60	74.7	5.95	0.02	0.88	1.34	1.19	0.90	0.06	0.00304	0.02832	0.00	-0.0035
353	5	7.49	0.43	4.7	Bay	17.10	3.6	13.78	0.32	1.56	4.73	4.50	1.47	1.45	0.00937	0.08863	9.58	0.0019
353	8	6.87	0.25	4.4	Bay	21.40	73.3	7.82	0.02	1.09	1.62	1.42	1.10	0.06	0.00310	0.04308	0.00	-0.0022
353	11	6.84	0.16	3.9	Bay	14.90	17.6	3.87	0.02	0.81	1.19	0.92	0.77	0.06	0.00309	0.02376	0.00	-0.0039
353	14	7.25	0.17	8.5	Sea	21.30	67.0	8.55	0.02	1.11	1.59	1.33	1.11	0.07	0.00320	0.04473	0.00	-0.0020
353	17	7.34	0.16	11.6	Sea	18.50	55.4	8.78	0.02	1.08	1.53	1.28	1.01	0.10	0.00348	0.04210	0.00	-0.0022
353	20	6.82	0.16	9.8	Sea	11.90	68.3	8.52	0.02	0.86	1.31	1.21	0.69	0.15	0.00399	0.02699	0.00	-0.0036
353	23	6.66	0.13	9.8	Sea	25.10	14.3	7.10	0.02	1.30	1.79	1.24	1.30	0.07	0.00315	0.06150	0.00	-0.0005
354	2	7.14	0.20	11.6	Sea	21.80	4.1	10.94	0.65	1.42	4.25	3.72	2.04	2.11	0.01128	0.07337	19.40	0.0006
354	5	7.28	0.17	11.6	Sea	28.90	4.1	9.42	0.54	1.56	4.12	3.29	2.48	1.41	0.00927	0.08839	16.09	0.0019
354	8	7.00	0.16	11.6	Sea	20.40	57.8	8.92	0.02	1.13	1.59	1.30	1.09	0.08	0.00336	0.04613	0.00	-0.0019
354	11	6.69	0.13	11.6	Sea	34.70	5.5	7.29	0.41	1.63	3.79	2.67	2.70	0.87	0.00748	0.09616	12.24	0.0026
354	14	7.00	0.15	9.8	Sea	22.90	76.0	7.95	0.02	1.06	1.50	1.23	1.15	0.05	0.00295	0.04117	0.00	-0.0023
354	17	7.47	0.16	11.6	Sea	13.60	5.9	8.59	0.02	1.02	1.48	1.24	0.80	0.16	0.00409	0.03805	0.00	-0.0026
354	20	6.95	0.17	11.6	Sea	18.20	1.5	9.12	0.02	1.20	1.70	1.35	1.03	0.13	0.00377	0.05226	0.00	-0.0013
354	23	6.59	0.08	3.7	Bay	35.40	1.7	1.72	0.02	1.34	1.77	0.71	1.63	0.02	0.00244	0.06562	0.00	-0.0001
355	2	6.97	0.15	9.8	Sea	17.60	85.8	8.08	0.02	0.88	1.29	1.18	0.91	0.07	0.00315	0.02809	0.00	-0.0035
355	5	7.46	0.15	9.8	Sea	25.60	26.8	7.60	0.02	1.33	1.83	1.29	1.33	0.07	0.00316	0.06393	0.00	-0.0003
355	8	7.16	0.15	11.6	Sea	30.70	57.7	8.37	0.50	1.41	3.60	2.94	2.47	1.05	0.00808	0.07197	14.90	0.0004
355	11	6.59	0.13	9.8	Sea	32.30	0.6	7.20	0.35	1.55	3.59	2.61	2.46	0.78	0.00714	0.08751	10.43	0.0018
355	14	6.65	0.10	9.8	Sea	18.80	39.2	5.34	0.02	0.95	1.32	0.97	0.96	0.06	0.00308	0.03277	0.00	-0.0031
355	17	7.16	0.17	8.5	Sea	17.10	13.0	8.36	0.02	1.14	1.64	1.33	0.96	0.12	0.00372	0.04691	0.00	-0.0018
355	20	6.97	0.16	11.6	Sea	11.70	57.6	8.77	0.02	0.89	1.33	1.21	0.69	0.17	0.00415	0.02896	0.00	-0.0034
355	23	6.47	0.13	3.0	Bay	35.60	11.1	1.31	0.02	1.32	1.74	0.63	1.62	0.02	0.00240	0.06368	0.00	-0.0003
356	2	6.59	0.09	4.7	Bay	21.60	37.1	3.40	0.02	0.95	1.32	0.86	1.05	0.04	0.00274	0.03314	0.00	-0.0030
356	5	7.25	0.17	4.4	Bay	15.60	0.9	5.01	0.02	0.91	1.35	1.07	0.82	0.08	0.00327	0.03039	0.00	-0.0033
356	8	7.19	0.14	3.9	Bay	20.50	84.6	3.21	0.02	0.78	1.08	0.81	0.95	0.03	0.00249	0.02227	0.00	-0.0040
356	11	6.57	0.09	9.8	Sea	26.30	35.9	5.16	0.02	1.19	1.61	1.02	1.30	0.05	0.00284	0.05129	0.00	-0.0014
356	14	6.43	0.05	14.2	Sea	35.40	44.9	3.07	0.02	1.36	1.77	0.78	1.64	0.03	0.00248	0.06695	0.00	-0.0000
356	17	6.99	0.13	6.7	Sea	18.30	27.6	6.14	0.02	1.03	1.47	1.14	0.97	0.08	0.00327	0.03833	0.00	-0.0026
356	20	7.04	0.16	5.6	Bay	6.80	38.6	6.62	0.02	0.74	1.19	1.13	0.42	0.22	0.00449	0.01981	0.00	-0.0042
356	23	6.54	0.09	6.7	Sea	25.40	5.1	4.48	0.02	1.17	1.61	1.00	1.26	0.05	0.00285	0.04996	0.00	-0.0015
357	2	6.53	0.07	5.6	Bay	35.40	16.6	2.98	0.09	1.41	2.36	1.25	2.01	0.13	0.00383	0.07238	2.53	0.0005
357	5	7.34	0.48	4.1	Bay	25.70	86.8	12.15	0.02	1.35	2.07	1.94	1.35	0.07	0.00324	0.06632	0.00	-0.0001

357	8	7.53	0.48	5.1	Bay	24.30	19.3	16.88	0.39	1.94	5.79	5.40	2.15	1.63	0.00991	0.13715	11.62	0.0063
357	11	7.05	0.44	5.1	Bay	20.60	57.1	16.61	0.40	1.69	5.52	5.33	1.85	1.73	0.01021	0.10361	12.10	0.0033
357	14	6.65	0.26	4.4	Bay	26.60	29.2	8.49	0.19	1.46	3.43	2.92	1.89	0.54	0.00615	0.07805	5.64	0.0010
357	17	7.09	0.25	5.1	Bay	19.20	82.4	9.34	0.02	1.06	1.62	1.51	1.02	0.08	0.00333	0.04081	0.00	-0.0024
357	20	7.32	0.19	6.1	Sea	24.30	66.6	7.98	0.02	1.19	1.70	1.38	1.24	0.06	0.00303	0.05127	0.00	-0.0014
357	23	6.90	0.19	11.6	Sea	18.20	62.3	10.38	0.02	1.13	1.63	1.42	1.01	0.11	0.00366	0.04618	0.00	-0.0019
358	2	6.64	0.15	9.8	Sea	24.60	21.7	8.16	0.02	1.34	1.86	1.35	1.30	0.08	0.00328	0.06501	0.00	-0.0002
358	5	7.16	0.21	9.8	Sea	21.60	10.5	11.06	0.55	1.43	4.22	3.75	1.97	1.85	0.01056	0.07456	16.54	0.0007
358	8	7.58	0.20	6.7	Bay	29.20	84.0	8.84	0.02	1.25	1.75	1.45	1.42	0.04	0.00277	0.05659	0.00	-0.0009
358	11	7.20	0.20	11.6	Sea	23.40	78.4	10.56	0.02	1.17	1.67	1.44	1.22	0.07	0.00317	0.05019	0.00	-0.0015
358	14	6.65	0.14	6.7	Sea	28.90	22.8	6.96	0.24	1.42	3.21	2.49	2.07	0.57	0.00629	0.07381	7.14	0.0006
358	17	6.93	0.18	9.8	Sea	18.10	73.5	9.88	0.02	1.06	1.55	1.39	0.99	0.10	0.00351	0.04049	0.00	-0.0024
358	20	7.37	0.30	5.1	Bay	20.80	2.2	10.65	0.28	1.45	3.94	3.57	1.66	1.00	0.00793	0.07660	8.23	0.0009
358	23	7.07	0.23	9.8	Sea	12.40	42.9	12.05	0.02	1.17	1.74	1.60	0.78	0.26	0.00472	0.04955	0.00	-0.0016
359	2	6.65	0.14	6.1	Sea	24.30	28.6	6.58	0.02	1.25	1.75	1.27	1.25	0.06	0.00309	0.05660	0.00	-0.0009
359	5	7.00	0.23	8.5	Sea	18.70	47.0	11.99	0.02	1.33	1.94	1.69	1.08	0.15	0.00396	0.06422	0.00	-0.0002
359	8	7.53	0.33	9.8	Sea	24.60	18.5	16.90	0.76	1.86	6.00	5.48	2.49	2.90	0.01341	0.12560	22.78	0.0053
359	11	7.28	0.24	6.1	Sea	28.80	73.0	10.27	0.32	1.39	3.75	3.45	2.20	0.80	0.00721	0.07052	9.62	0.0003
359	14	6.62	0.17	9.8	Sea	27.30	15.9	9.61	0.47	1.52	4.02	3.32	2.30	1.30	0.00891	0.08394	14.04	0.0015
359	17	6.69	0.20	8.5	Sea	18.20	72.2	10.49	0.02	1.11	1.65	1.49	1.01	0.11	0.00361	0.04498	0.00	-0.0020
359	20	7.14	0.28	8.5	Sea	16.40	4.4	14.07	0.60	1.48	4.90	4.63	1.62	2.59	0.01261	0.07944	18.00	0.0011
359	23	7.01	0.24	9.8	Sea	13.90	35.0	12.85	0.02	1.27	1.88	1.70	0.87	0.25	0.00468	0.05901	0.00	-0.0007
360	2	6.55	0.12	7.5	Bay	32.40	7.5	5.98	0.23	1.49	3.16	2.22	2.25	0.47	0.00587	0.08103	6.73	0.0013
360	5	6.74	0.15	6.1	Sea	30.70	86.2	6.78	0.02	1.20	1.64	1.26	1.44	0.03	0.00256	0.05243	0.00	-0.0013
360	8	7.35	0.32	6.1	Bay	19.50	26.2	13.32	0.40	1.54	4.68	4.38	1.72	1.61	0.00987	0.08586	12.00	0.0017
360	11	7.33	0.24	6.7	Bay	18.00	79.1	10.66	0.02	1.10	1.68	1.57	0.99	0.11	0.00360	0.04432	0.00	-0.0020
360	14	6.71	0.12	8.5	Sea	29.10	21.3	6.50	0.29	1.39	3.16	2.36	2.13	0.64	0.00659	0.07061	8.52	0.0003
360	17	6.71	0.12	7.5	Bay	27.00	16.9	5.83	0.02	1.30	1.78	1.17	1.36	0.05	0.00296	0.06114	0.00	-0.0005
360	20	7.16	0.19	6.1	Sea	12.30	17.2	8.08	0.02	1.00	1.51	1.34	0.72	0.16	0.00406	0.03631	0.00	-0.0028
360	23	7.22	0.20	9.8	Sea	11.10	32.5	10.42	0.02	1.05	1.58	1.44	0.69	0.25	0.00468	0.04038	0.00	-0.0024
361	2	6.76	0.12	9.8	Sea	28.80	36.6	6.65	0.02	1.35	1.84	1.21	1.44	0.05	0.00293	0.06630	0.00	-0.0001
361	5	6.74	0.10	7.5	Bay	32.50	2.4	4.96	0.19	1.43	2.88	1.89	2.16	0.37	0.00535	0.07483	5.66	0.0007
361	8	7.30	0.27	4.1	Bay	23.60	41.8	7.01	0.02	1.24	1.80	1.40	1.22	0.06	0.00312	0.05636	0.00	-0.0010
361	11	7.44	0.39	4.7	Bay	10.30	35.0	12.58	0.02	1.27	2.00	1.91	0.66	0.30	0.00499	0.05852	0.00	-0.0008
361	14	6.87	0.24	4.4	Bay	23.90	80.6	7.54	0.02	1.09	1.60	1.39	1.19	0.05	0.00290	0.04354	0.00	-0.0021
361	17	6.66	0.17	3.9	Bay	24.40	16.1	4.31	0.02	1.15	1.61	1.07	1.21	0.05	0.00285	0.04774	0.00	-0.0017
361	20	7.01	0.17	6.7	Bay	17.00	58.0	7.76	0.02	1.01	1.49	1.28	0.92	0.09	0.00344	0.03683	0.00	-0.0027
361	23	7.27	0.14	7.5	Sea	17.40	45.1	6.95	0.02	1.00	1.45	1.18	0.93	0.09	0.00337	0.03660	0.00	-0.0027
362	2	6.89	0.18	8.5	Sea	18.30	69.7	9.36	0.02	1.06	1.56	1.38	0.99	0.09	0.00347	0.04107	0.00	-0.0023
362	5	6.67	0.14	3.5	Bay	21.00	42.3	2.55	0.02	0.88	1.22	0.77	1.00	0.03	0.00262	0.02826	0.00	-0.0035
362	8	7.06	0.17	7.5	Sea	15.60	24.7	8.18	0.02	1.07	1.57	1.32	0.88	0.13	0.00377	0.04193	0.00	-0.0023
362	11	7.34	0.13	5.1	Bay	30.80	1.8	4.72	0.13	1.38	2.63	1.79	1.93	0.25	0.00470	0.06918	3.72	0.0002
362	14	6.94	0.15	9.8	Sea	22.80	11.4	8.16	0.02	1.29	1.81	1.33	1.22	0.09	0.00337	0.06083	0.00	-0.0006
362	17	6.61	0.15	4.4	Bay	23.00	43.8	4.86	0.02	1.08	1.52	1.09	1.14	0.05	0.00287	0.04237	0.00	-0.0022
362	20	6.87	0.13	7.5	Bay	9.70	70.9	6.34	0.02	0.69	1.09	1.02	0.55	0.13	0.00383	0.01741	0.00	-0.0045
362	23	7.22	0.17	8.5	Sea	22.30	49.8	8.57	0.02	1.22	1.73	1.37	1.18	0.08	0.00329	0.05394	0.00	-0.0012
363	2	6.98	0.16	9.8	Sea	16.80	66.0	8.66	0.02	0.99	1.45	1.27	0.92	0.10	0.00351	0.03578	0.00	-0.0028
363	5	6.63	0.16	9.8	Sea	15.90	52.3	8.66	0.02	1.02	1.49	1.28	0.89	0.12	0.00369	0.03799	0.00	-0.0026
363	8	6.82	0.20	9.8	Sea	9.30	48.0	10.96	0.02	1.02	1.55	1.46	0.60	0.31	0.00506	0.03752	0.00	-0.0027
363	11	7.17	0.27	11.6	Sea	27.30	48.9	14.60	0.81	1.67	5.33	4.82	2.67	2.52	0.01241	0.10190	24.25	0.0031
363	14	6.82	0.28	3.1	Bay	22.50	37.2	3.17	0.02	0.98	1.38	0.91	1.08	0.04	0.00270	0.03521	0.00	-0.0029
363	17	6.47	0.24	7.5	Bay	25.20	7.4	12.64	0.45	1.67	4.74	4.20	2.21	1.56	0.00971	0.10139	13.59	0.0031
363	20	6.72	0.19	3.1	Bay	41.50	23.9	2.23	0.04	1.58	2.28	1.01	2.06	0.05	0.00288	0.09054	1.02	0.0021
363	23	7.15	0.25	8.5	Sea	26.40	53.3	12.48	0.53	1.54	4.57	4.15	2.32	1.59	0.00979	0.08624	15.71	0.0017
364	2	7.11	0.27	3.9	Bay	27.30	11.5	6.22	0.13	1.38	2.84	2.23	1.77	0.31	0.00505	0.06889	3.73	0.0002
364	5	6.81	0.49	4.7	Bay	37.50	15.5	17.44	0.32	2.40	6.24	5.46	3.06	1.12	0.00833	0.20890	8.76	0.0128
364	8	6.88	0.31	4.4	Bay	23.60	19.4	9.68	0.22	1.47	3.70	3.27	1.76	0.71	0.00685	0.07879	6.41	0.0011
364	11	7.19	0.32	4.4	Bay	12.80	49.0	9.59	0.02	1.10	1.72	1.60	0.75	0.17	0.00413	0.04372	0.00	-0.0021
364	14	7.04	0.22	8.5	Sea	19.60	52.6	11.12	0.02	1.28	1.86	1.61	1.10	0.12	0.00374	0.05946	0.00	-0.0007
364	17	6.64	0.23	8.5	Sea	15.20	88.9	12.08	0.02	1.06	1.64	1.60	0.88	0.15	0.00399	0.04080	0.00	-0.0024

364	20	6.57	0.17	8.5	Sea	4.60	3.7	8.90	0.02	0.82	1.31	1.27	0.32	0.49	0.00592	0.02473	0.00	-0.0038
364	23	6.96	0.19	8.5	Sea	17.60	24.4	9.86	0.02	1.23	1.78	1.49	1.01	0.14	0.00387	0.05502	0.00	-0.0011
365	2	7.05	0.15	7.5	Bay	26.00	48.5	7.50	0.02	1.28	1.79	1.32	1.33	0.06	0.00304	0.05982	0.00	-0.0006
365	5	6.77	0.15	9.8	Sea	13.80	28.8	8.23	0.02	1.00	1.45	1.24	0.80	0.15	0.00394	0.03607	0.00	-0.0028
365	8	6.71	0.14	7.5	Bay	11.40	18.1	7.30	0.02	0.90	1.35	1.18	0.67	0.16	0.00404	0.02954	0.00	-0.0034
365	11	7.09	0.23	8.5	Sea	12.40	4.7	11.84	0.02	1.22	1.82	1.64	0.78	0.26	0.00477	0.05434	0.00	-0.0011
365	14	7.13	0.18	14.2	Sea	18.40	36.4	10.16	0.02	1.20	1.70	1.39	1.04	0.13	0.00381	0.05246	0.00	-0.0013
365	17	6.82	0.15	8.5	Sea	12.30	81.9	8.11	0.02	0.81	1.25	1.19	0.69	0.12	0.00375	0.02360	0.00	-0.0039
365	20	6.69	0.15	8.5	Sea	14.60	5.1	8.05	0.02	1.04	1.52	1.27	0.84	0.14	0.00388	0.03963	0.00	-0.0025
365	23	6.98	0.17	14.2	Sea	11.60	43.1	9.49	0.02	0.95	1.40	1.25	0.71	0.21	0.00441	0.03311	0.00	-0.0030
366	2	7.15	0.15	14.2	Sea	10.40	0.6	8.47	0.02	0.91	1.32	1.15	0.64	0.22	0.00452	0.02983	0.00	-0.0033
366	5	6.92	0.15	9.8	Sea	8.40	47.0	7.85	0.02	0.80	1.22	1.14	0.52	0.23	0.00457	0.02306	0.00	-0.0040
366	8	6.73	0.11	8.5	Sea	23.10	2.0	5.70	0.02	1.16	1.61	1.09	1.18	0.06	0.00306	0.04928	0.00	-0.0016
366	11	7.02	0.13	14.2	Sea	17.30	53.2	7.04	0.02	0.94	1.32	1.05	0.92	0.08	0.00331	0.03222	0.00	-0.0031
366	14	7.19	0.13	11.6	Sea	5.60	25.4	6.88	0.02	0.68	1.04	0.98	0.37	0.33	0.00512	0.01660	0.00	-0.0045
366	17	6.95	0.10	9.8	Sea	16.50	7.1	5.58	0.02	0.93	1.32	0.98	0.88	0.08	0.00332	0.03173	0.00	-0.0032
366	20	6.72	0.07	8.5	Sea	21.30	10.0	3.59	0.02	0.97	1.32	0.81	1.05	0.04	0.00282	0.03410	0.00	-0.0030
366	23	6.97	0.13	8.5	Sea	17.70	84.9	6.50	0.02	0.82	1.19	1.05	0.89	0.05	0.00295	0.02421	0.00	-0.0039

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8901

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
1	2	7.28	0.11	8.5	Sea	18.70	26.3	5.47	0.02	0.99	1.38	1.01	0.97	0.07	0.00316	0.03533	0.00	-0.0028
1	5	7.18	0.13	9.8	Sea	21.80	76.2	6.62	0.02	0.97	1.36	1.08	1.08	0.05	0.00285	0.03425	0.00	-0.0029
1	8	6.88	0.28	3.9	Bay	8.10	24.5	6.86	0.02	0.84	1.36	1.28	0.48	0.19	0.00425	0.02546	0.00	-0.0037
1	11	7.08	0.74	6.1	Sea	9.20	59.6	32.21	0.68	2.43	9.30	9.27	1.11	5.45	0.01985	0.21451	19.48	0.0133
1	14	7.30	0.84	6.7	Bay	5.90	63.5	38.05	0.53	2.71	9.39	9.38	0.75	6.48	0.02245	0.26753	14.64	0.0180
1	17	7.23	0.84	4.7	Bay	11.50	47.6	28.02	0.56	2.30	8.63	8.57	1.25	3.77	0.01565	0.19246	16.69	0.0113
1	20	6.99	0.60	6.7	Bay	20.70	68.8	28.25	0.80	2.28	8.79	8.67	2.31	4.18	0.01668	0.18889	24.01	0.0110
1	23	7.04	0.48	7.5	Bay	16.70	10.8	23.50	0.77	2.08	7.57	7.34	1.87	4.18	0.01668	0.15732	23.15	0.0081
2	2	7.40	0.46	7.5	Bay	18.70	3.0	21.59	0.72	2.02	7.09	6.80	2.01	3.60	0.01521	0.14904	21.50	0.0074
2	5	7.41	0.43	8.5	Sea	19.30	75.9	21.31	0.85	1.75	6.85	6.76	2.10	3.82	0.01578	0.11088	25.51	0.0039
2	8	7.04	0.38	9.8	Sea	10.20	56.1	20.16	0.97	1.59	6.52	6.46	1.23	5.47	0.01990	0.09167	28.95	0.0022
2	11	6.95	0.32	8.5	Sea	9.10	14.5	16.33	0.71	1.42	5.41	5.32	1.00	3.97	0.01615	0.07287	21.26	0.0005
2	14	7.17	0.28	8.5	Sea	6.40	59.4	14.13	0.02	1.17	1.83	1.80	0.46	0.60	0.00644	0.04979	0.00	-0.0015
2	17	7.22	0.25	8.5	Sea	11.80	68.9	12.55	0.02	1.13	1.74	1.66	0.74	0.26	0.00474	0.04623	0.00	-0.0019
2	20	6.88	0.18	9.8	Sea	15.80	33.3	9.76	0.02	1.14	1.66	1.41	0.92	0.15	0.00398	0.04728	0.00	-0.0018
2	23	6.82	0.12	8.5	Sea	18.50	34.5	6.49	0.02	1.03	1.46	1.12	0.98	0.08	0.00329	0.03836	0.00	-0.0026
3	2	7.24	0.16	7.5	Bay	14.30	49.3	7.55	0.02	0.94	1.40	1.22	0.80	0.12	0.00367	0.03224	0.00	-0.0031
3	5	7.42	0.16	8.5	Sea	14.90	38.5	7.92	0.02	1.00	1.46	1.24	0.84	0.12	0.00374	0.03637	0.00	-0.0028
3	8	7.05	0.12	9.8	Sea	14.30	44.7	6.33	0.02	0.86	1.24	1.03	0.78	0.10	0.00348	0.02682	0.00	-0.0036
3	11	6.84	0.11	9.8	Sea	17.00	32.3	6.06	0.02	0.95	1.35	1.03	0.90	0.08	0.00331	0.03290	0.00	-0.0031
3	14	7.01	0.12	8.5	Sea	14.30	8.9	6.37	0.02	0.92	1.34	1.08	0.79	0.11	0.00361	0.03104	0.00	-0.0032
3	17	7.15	0.17	8.5	Sea	7.90	81.8	8.63	0.02	0.78	1.25	1.23	0.49	0.25	0.00466	0.02203	0.00	-0.0040
3	20	6.86	0.13	9.8	Sea	12.20	17.6	7.03	0.02	0.89	1.30	1.10	0.70	0.14	0.00392	0.02859	0.00	-0.0035
3	23	6.61	0.13	8.5	Sea	28.70	11.9	7.15	0.31	1.43	3.35	2.57	2.16	0.74	0.00699	0.07458	9.27	0.0007
4	2	7.02	0.41	4.1	Bay	24.40	37.9	11.16	0.23	1.55	4.07	3.71	1.85	0.77	0.00711	0.08761	6.78	0.0019
4	5	7.46	0.83	5.1	Bay	9.50	38.5	29.22	0.63	2.33	8.97	8.92	1.08	4.47	0.01740	0.19827	18.06	0.0118
4	8	7.34	0.93	6.1	Bay	21.70	51.6	39.49	0.29	3.09	8.65	8.47	2.22	3.01	0.01370	0.34766	7.14	0.0253
4	11	7.06	0.94	5.1	Bay	26.30	37.2	35.20	0.24	3.07	8.11	7.80	2.46	2.07	0.01119	0.34177	5.58	0.0247
4	14	7.05	0.65	5.6	Bay	29.90	9.9	26.41	0.33	2.70	7.38	6.86	2.73	1.87	0.01063	0.26432	8.65	0.0178
4	17	7.43	0.74	4.7	Bay	11.60	81.7	23.73	0.51	1.93	7.42	7.40	1.20	3.15	0.01405	0.13570	15.16	0.0062
4	20	7.23	0.59	5.6	Bay	13.80	82.6	23.44	0.59	1.88	7.36	7.34	1.46	3.39	0.01468	0.12847	17.79	0.0055
4	23	6.84	0.58	5.1	Bay	30.20	38.0	22.61	0.43	2.40	7.27	6.83	2.77	1.91	0.01072	0.20936	12.20	0.0128
5	2	7.02	0.54	4.7	Bay	10.40	74.2	18.59	0.43	1.60	5.96	5.94	1.02	2.50	0.01236	0.09292	12.80	0.0023
5	5	7.52	0.41	11.6	Sea	32.90	26.6	21.91	1.03	2.35	7.69	6.89	3.56	3.74	0.01555	0.20015	30.07	0.0120
5	8	7.46	0.33	11.6	Sea	30.90	52.0	17.66	0.93	1.92	6.29	5.72	3.14	2.94	0.01351	0.13414	27.77	0.0060
5	11	6.92	0.30	9.8	Sea	17.80	69.4	16.07	0.80	1.43	5.38	5.25	1.86	3.24	0.01428	0.07405	24.08	0.0006
5	14	6.85	0.26	9.8	Sea	10.50	26.1	14.17	0.02	1.28	1.92	1.80	0.71	0.40	0.00550	0.05985	0.00	-0.0006
5	17	7.27	0.37	14.2	Sea	15.70	8.4	20.44	1.36	1.76	6.84	6.55	2.00	6.49	0.02248	0.11276	40.64	0.0041
5	20	7.20	0.25	14.2	Sea	19.50	73.5	13.83	0.02	1.26	1.83	1.67	1.12	0.14	0.00388	0.05821	0.00	-0.0008
5	23	6.71	0.17	14.2	Sea	26.30	10.7	9.87	0.70	1.48	4.19	3.43	2.42	1.92	0.01077	0.07993	21.03	0.0012
6	2	6.74	0.16	14.2	Sea	30.30	45.9	9.27	0.66	1.48	4.02	3.24	2.63	1.51	0.00955	0.08005	19.74	0.0012
6	5	7.35	0.22	14.2	Sea	28.20	14.8	11.86	0.81	1.65	4.85	4.04	2.71	2.32	0.01186	0.09913	24.20	0.0029
6	8	7.52	0.17	11.6	Sea	29.30	55.6	9.13	0.54	1.41	3.78	3.17	2.44	1.24	0.00872	0.07246	16.24	0.0005
6	11	6.97	0.16	14.2	Sea	15.10	30.1	8.93	0.02	1.05	1.49	1.24	0.87	0.15	0.00394	0.03986	0.00	-0.0024
6	14	6.71	0.17	14.2	Sea	24.00	32.6	10.10	0.74	1.38	4.08	3.49	2.24	2.08	0.01121	0.06915	22.15	0.0002
6	17	7.26	0.21	4.7	Bay	16.40	34.5	6.86	0.02	1.03	1.53	1.29	0.89	0.09	0.00347	0.03853	0.00	-0.0026
6	20	7.41	0.25	8.5	Sea	6.40	70.2	12.19	0.02	1.03	1.63	1.60	0.45	0.50	0.00598	0.03830	0.00	-0.0026
6	23	7.01	0.20	7.5	Sea	19.50	2.6	10.04	0.02	1.33	1.92	1.57	1.10	0.13	0.00380	0.06459	0.00	-0.0002
7	2	6.92	0.17	8.5	Sea	34.10	20.5	8.55	0.35	1.68	3.97	3.02	2.62	0.82	0.00728	0.10257	10.40	0.0032
7	5	7.51	0.26	3.7	Bay	25.30	70.4	4.56	0.02	1.05	1.47	1.08	1.21	0.03	0.00264	0.04003	0.00	-0.0024

7	8	7.83	0.29	6.1	Sea	28.50	39.1	11.52	0.34	1.65	4.38	3.85	2.28	1.02	0.00799	0.09873	10.09	0.0029
7	11	7.39	0.31	8.5	Sea	27.10	27.4	15.19	0.60	1.83	5.52	4.97	2.53	2.08	0.01121	0.12169	17.85	0.0049
7	14	6.89	0.30	9.8	Sea	32.00	27.1	16.01	0.70	2.01	5.99	5.23	3.05	2.25	0.01167	0.14690	20.91	0.0072
7	17	7.29	0.31	8.5	Sea	9.20	49.2	15.33	0.02	1.31	2.01	1.94	0.64	0.48	0.00588	0.06243	0.00	-0.0004
7	20	7.61	0.30	9.8	Sea	13.20	27.7	15.01	0.76	1.40	5.11	4.93	1.41	3.55	0.01509	0.07148	22.65	0.0004
7	23	7.21	0.26	8.5	Sea	18.40	41.5	12.97	0.57	1.40	4.57	4.30	1.74	2.17	0.01147	0.07125	16.96	0.0004
8	2	6.84	0.17	8.5	Sea	22.50	21.1	8.67	0.02	1.31	1.85	1.42	1.22	0.09	0.00343	0.06264	0.00	-0.0004
8	5	7.32	0.25	7.5	Sea	14.80	24.8	12.07	0.02	1.30	1.93	1.73	0.90	0.21	0.00444	0.06157	0.00	-0.0005
8	8	7.78	0.29	8.5	Sea	31.20	18.3	13.77	0.53	1.90	5.31	4.57	2.77	1.67	0.01002	0.13085	15.94	0.0057
8	11	7.43	0.22	9.8	Sea	40.40	62.8	11.53	0.52	1.83	4.72	3.90	3.28	1.09	0.00825	0.12201	15.63	0.0050
8	14	6.72	0.15	11.6	Sea	35.00	15.6	8.28	0.46	1.68	4.07	2.97	2.81	1.02	0.00800	0.10303	13.73	0.0032
8	17	7.03	0.19	9.8	Sea	21.90	78.8	10.22	0.02	1.13	1.63	1.44	1.15	0.07	0.00323	0.04657	0.00	-0.0018
8	20	7.50	0.26	8.5	Sea	11.70	36.7	12.69	0.02	1.22	1.84	1.71	0.75	0.29	0.00495	0.05425	0.00	-0.0011
8	23	7.23	0.23	11.6	Sea	18.20	2.1	12.59	0.75	1.41	4.60	4.21	1.83	2.82	0.01321	0.07199	22.41	0.0005
9	2	6.72	0.07	11.6	Sea	41.10	0.8	4.17	0.23	1.66	3.23	1.72	2.74	0.37	0.00536	0.10055	6.94	0.0030
9	5	6.96	0.12	9.8	Sea	27.70	76.4	6.59	0.02	1.14	1.56	1.14	1.33	0.04	0.00267	0.04755	0.00	-0.0017
9	8	7.62	0.28	6.1	Sea	15.90	1.8	11.51	0.02	1.34	2.00	1.76	0.95	0.19	0.00426	0.06551	0.00	-0.0001
9	13	7.43	0.12	9.8	Sea	24.30	9.7	6.02	0.02	1.21	1.67	1.11	1.24	0.06	0.00306	0.05352	0.00	-0.0012
9	16	6.72	0.10	8.5	Sea	26.20	21.8	5.07	0.02	1.21	1.65	1.04	1.30	0.05	0.00288	0.05337	0.00	-0.0012
9	19	7.24	0.16	6.1	Sea	15.10	19.4	6.68	0.02	0.98	1.45	1.20	0.83	0.10	0.00357	0.03517	0.00	-0.0029
9	22	7.42	0.18	11.6	Sea	9.30	57.8	9.79	0.02	0.90	1.37	1.29	0.59	0.27	0.00479	0.02964	0.00	-0.0034
10	1	6.89	0.12	5.6	Bay	27.00	8.8	4.96	0.02	1.26	1.74	1.11	1.34	0.05	0.00287	0.05803	0.00	-0.0008
10	4	6.62	0.04	9.8	Sea	36.10	48.5	2.37	0.02	1.35	1.76	0.71	1.65	0.02	0.00242	0.06612	0.00	-0.0001
10	7	7.25	0.13	6.1	Bay	21.80	66.8	5.39	0.02	0.98	1.38	1.06	1.07	0.04	0.00282	0.03472	0.00	-0.0029
10	10	7.60	0.17	3.7	Bay	18.50	49.4	2.85	0.02	0.80	1.13	0.79	0.89	0.04	0.00270	0.02355	0.00	-0.0039
10	13	7.10	0.27	4.7	Bay	19.40	31.4	9.12	0.02	1.28	1.89	1.59	1.07	0.11	0.00361	0.05925	0.00	-0.0007
10	16	6.58	0.12	6.1	Sea	27.00	17.8	5.33	0.02	1.27	1.76	1.14	1.35	0.05	0.00290	0.05908	0.00	-0.0007
10	19	7.02	0.23	5.1	Bay	11.90	29.9	8.76	0.02	1.04	1.60	1.46	0.71	0.18	0.00417	0.03912	0.00	-0.0025
10	22	7.40	0.23	4.4	Bay	13.70	35.0	6.44	0.02	0.93	1.42	1.23	0.75	0.11	0.00358	0.03128	0.00	-0.0032
11	1	7.07	0.19	7.5	Bay	19.30	22.3	9.39	0.02	1.27	1.83	1.49	1.08	0.12	0.00369	0.05832	0.00	-0.0008
11	4	6.59	0.07	5.1	Bay	27.80	12.9	2.82	0.02	1.15	1.55	0.82	1.32	0.03	0.00261	0.04802	0.00	-0.0017
11	7	7.02	0.18	6.7	Bay	21.10	28.2	8.40	0.02	1.26	1.80	1.43	1.14	0.09	0.00344	0.05742	0.00	-0.0009
11	10	7.56	0.22	7.5	Sea	18.80	15.7	10.21	0.02	1.31	1.90	1.58	1.07	0.13	0.00385	0.06268	0.00	-0.0004
11	13	7.23	0.18	7.5	Sea	15.00	75.7	8.62	0.02	0.93	1.41	1.30	0.83	0.11	0.00359	0.03123	0.00	-0.0032
11	16	6.63	0.10	9.8	Sea	24.90	0.9	5.57	0.02	1.21	1.65	1.07	1.26	0.06	0.00299	0.05312	0.00	-0.0012
11	19	6.89	0.13	7.5	Sea	12.80	79.0	6.28	0.02	0.72	1.11	1.02	0.69	0.09	0.00337	0.01907	0.00	-0.0043
11	22	7.46	0.24	6.1	Sea	12.20	12.8	10.02	0.02	1.13	1.72	1.56	0.74	0.21	0.00441	0.04657	0.00	-0.0018
12	1	7.31	0.30	5.1	Bay	18.10	69.3	10.81	0.02	1.20	1.84	1.70	1.01	0.12	0.00371	0.05246	0.00	-0.0013
12	4	6.77	0.24	5.6	Bay	18.90	1.7	10.26	0.30	1.36	3.78	3.46	1.54	1.10	0.00825	0.06714	8.86	0.0000
12	7	6.85	0.25	5.6	Bay	8.90	79.4	10.36	0.02	0.97	1.58	1.56	0.56	0.26	0.00475	0.03413	0.00	-0.0030
12	10	7.45	0.44	5.6	Bay	23.20	36.5	17.00	0.43	1.85	5.77	5.45	2.10	1.81	0.01044	0.12516	12.97	0.0052
12	13	7.35	0.32	6.7	Sea	25.80	81.9	14.33	0.49	1.45	4.81	4.67	2.25	1.52	0.00959	0.07676	14.58	0.0009
12	16	6.70	0.23	11.6	Sea	25.30	1.3	12.92	0.72	1.65	4.97	4.33	2.44	2.36	0.01197	0.09881	21.60	0.0029
12	19	6.68	0.25	8.5	Sea	22.40	55.5	13.42	0.57	1.47	4.73	4.43	2.07	1.97	0.01090	0.07885	17.19	0.0011
12	22	7.25	0.42	8.5	Sea	21.80	3.6	20.97	0.79	2.05	7.03	6.63	2.34	3.59	0.01518	0.15340	23.52	0.0078
13	1	7.32	0.29	7.5	Sea	28.30	79.7	14.08	0.53	1.50	4.80	4.60	2.46	1.51	0.00957	0.08186	15.80	0.0013
13	4	6.77	0.18	9.8	Sea	24.10	12.1	9.64	0.48	1.42	3.91	3.32	2.07	1.43	0.00933	0.07373	14.46	0.0006
13	7	6.69	0.14	9.8	Sea	33.20	54.7	7.57	0.37	1.47	3.47	2.69	2.50	0.74	0.00699	0.07871	11.21	0.0011
13	10	7.28	0.29	3.9	Bay	23.60	37.2	6.42	0.02	1.22	1.76	1.35	1.21	0.06	0.00307	0.05456	0.00	-0.0011
13	13	7.48	0.38	4.1	Bay	5.20	73.4	9.45	0.02	0.92	1.57	1.56	0.34	0.36	0.00529	0.03103	0.00	-0.0032
13	16	7.05	0.59	5.1	Bay	29.70	63.1	22.21	0.49	2.20	7.19	6.92	2.74	1.98	0.01091	0.17532	14.56	0.0097
13	19	6.84	0.42	4.7	Bay	37.50	29.8	14.98	0.30	2.20	5.62	4.87	2.96	0.95	0.00776	0.17586	9.08	0.0098
13	22	7.28	0.42	4.1	Bay	19.80	51.5	10.75	0.02	1.35	2.04	1.82	1.11	0.12	0.00369	0.06589	0.00	-0.0001
14	1	7.53	0.31	4.7	Bay	23.90	13.4	9.81	0.23	1.49	3.77	3.32	1.81	0.76	0.00707	0.08089	6.95	0.0013
14	4	7.12	0.30	4.7	Bay	24.40	31.0	10.10	0.24	1.49	3.82	3.40	1.85	0.77	0.00710	0.08076	7.16	0.0012
14	7	6.67	0.18	4.1	Bay	26.00	80.5	5.29	0.02	1.05	1.47	1.14	1.23	0.03	0.00262	0.04017	0.00	-0.0024
14	10	6.95	0.19	3.7	Bay	10.30	60.1	3.82	0.02	0.61	0.96	0.86	0.54	0.07	0.00324	0.01335	0.00	-0.0048
14	13	7.30	0.17	8.5	Sea	24.50	23.9	8.31	0.02	1.35	1.89	1.40	1.30	0.08	0.00329	0.06612	0.00	-0.0001
14	16	6.97	0.19	11.6	Sea	19.40	33.7	10.32	0.02	1.26	1.79	1.46	1.10	0.13	0.00377	0.05803	0.00	-0.0008
14	19	6.62	0.14	11.6	Sea	20.50	0.8	8.01	0.02	1.20	1.68	1.26	1.11	0.10	0.00348	0.05279	0.00	-0.0013

14	22	6.86	0.23	9.8	Sea	9.50	56.8	12.54	0.02	1.10	1.69	1.61	0.63	0.36	0.00530	0.04412	0.00	-0.0021
15	1	7.34	0.30	4.4	Bay	26.90	38.1	8.57	0.19	1.45	3.42	2.94	1.91	0.53	0.00613	0.07667	5.71	0.0009
15	4	7.18	0.25	4.4	Bay	27.60	84.4	7.40	0.02	1.16	1.66	1.39	1.34	0.04	0.00273	0.04919	0.00	-0.0016
15	7	6.74	0.19	6.1	Sea	21.30	0.8	8.46	0.02	1.31	1.87	1.47	1.16	0.10	0.00349	0.06201	0.00	-0.0004
15	10	6.72	0.20	9.8	Sea	19.50	53.3	10.94	0.02	1.25	1.80	1.55	1.09	0.12	0.00372	0.05670	0.00	-0.0009
15	13	7.15	0.29	8.5	Sea	13.20	0.5	14.61	0.63	1.42	4.98	4.80	1.35	3.03	0.01374	0.07342	18.99	0.0006
15	16	7.09	0.27	6.7	Sea	13.70	74.2	12.37	0.02	1.16	1.80	1.73	0.83	0.20	0.00436	0.04885	0.00	-0.0016
15	19	6.66	0.18	7.5	Sea	27.00	10.0	9.13	0.34	1.51	3.81	3.16	2.14	0.96	0.00780	0.08271	10.23	0.0014
15	22	6.67	0.16	7.5	Sea	28.60	49.0	7.95	0.31	1.39	3.36	2.78	2.14	0.72	0.00691	0.06984	9.21	0.0003
16	1	7.25	0.29	6.7	Sea	20.60	2.6	13.30	0.44	1.58	4.75	4.38	1.84	1.72	0.01017	0.09132	13.07	0.0022
16	4	7.34	0.24	7.5	Sea	32.50	71.7	11.29	0.42	1.54	4.18	3.77	2.59	0.99	0.00790	0.08600	12.55	0.0017
16	7	6.94	0.19	11.6	Sea	18.60	49.4	10.29	0.02	1.19	1.70	1.43	1.04	0.12	0.00373	0.05126	0.00	-0.0014
16	10	6.81	0.24	3.5	Bay	31.70	34.3	4.35	0.08	1.36	2.41	1.65	1.83	0.15	0.00396	0.06765	2.33	0.0001
16	13	7.07	0.25	3.5	Bay	17.00	31.8	4.05	0.02	0.88	1.28	0.98	0.86	0.06	0.00300	0.02788	0.00	-0.0035
16	16	7.25	0.21	6.7	Sea	12.50	54.2	9.79	0.02	1.04	1.59	1.48	0.74	0.18	0.00422	0.03924	0.00	-0.0025
16	19	6.90	0.17	9.8	Sea	20.30	20.0	8.99	0.02	1.25	1.77	1.39	1.12	0.11	0.00359	0.05722	0.00	-0.0009
16	22	6.71	0.10	9.8	Sea	21.70	29.3	5.42	0.02	1.07	1.47	1.01	1.10	0.06	0.00302	0.04141	0.00	-0.0023
17	1	7.18	0.14	8.5	Sea	17.50	15.2	6.98	0.02	1.06	1.51	1.18	0.95	0.10	0.00348	0.04072	0.00	-0.0024
17	4	7.45	0.12	7.5	Bay	35.20	12.9	5.42	0.20	1.55	3.12	2.05	2.36	0.39	0.00545	0.08707	6.01	0.0018
17	7	7.15	0.14	9.8	Sea	30.30	57.8	7.27	0.02	1.35	1.84	1.27	1.49	0.04	0.00283	0.06629	0.00	-0.0001
17	10	6.75	0.13	8.5	Sea	22.90	6.6	7.01	0.02	1.24	1.73	1.24	1.20	0.07	0.00323	0.05575	0.00	-0.0010
17	13	6.84	0.15	8.5	Sea	7.80	58.3	7.83	0.02	0.78	1.22	1.16	0.48	0.24	0.00461	0.02185	0.00	-0.0041
17	16	7.15	0.15	8.5	Sea	12.80	16.0	7.86	0.02	0.97	1.43	1.23	0.74	0.15	0.00401	0.03429	0.00	-0.0029
17	19	6.95	0.13	8.5	Sea	13.30	15.2	6.93	0.02	0.93	1.35	1.13	0.75	0.13	0.00378	0.03114	0.00	-0.0032
17	22	6.56	0.11	6.1	Bay	30.50	3.8	4.93	0.16	1.37	2.72	1.86	1.98	0.32	0.00508	0.06873	4.64	0.0002
18	1	6.81	0.10	9.8	Sea	34.40	16.0	5.27	0.26	1.50	3.12	2.02	2.40	0.49	0.00592	0.08153	7.74	0.0013
18	4	7.33	0.14	6.7	Sea	15.70	12.7	6.55	0.02	0.99	1.44	1.17	0.86	0.10	0.00352	0.03578	0.00	-0.0028
18	7	7.19	0.14	9.8	Sea	20.10	89.2	7.51	0.02	0.89	1.28	1.13	1.00	0.05	0.00288	0.02884	0.00	-0.0034
18	10	6.69	0.11	9.8	Sea	27.60	11.8	5.82	0.02	1.31	1.78	1.12	1.39	0.05	0.00294	0.06219	0.00	-0.0004
18	13	6.63	0.13	7.5	Sea	21.00	51.8	6.75	0.02	1.08	1.52	1.19	1.08	0.06	0.00311	0.04208	0.00	-0.0022
18	16	7.05	0.14	9.8	Sea	18.10	11.4	7.71	0.02	1.12	1.58	1.24	0.99	0.10	0.00356	0.04533	0.00	-0.0019
18	19	7.03	0.14	9.8	Sea	22.10	67.8	7.56	0.02	1.07	1.50	1.20	1.12	0.06	0.00302	0.04138	0.00	-0.0023
18	22	6.54	0.12	8.5	Sea	27.30	6.8	6.18	0.02	1.33	1.82	1.19	1.38	0.06	0.00300	0.06437	0.00	-0.0002
19	1	6.63	0.11	8.5	Sea	16.70	49.1	5.65	0.02	0.88	1.26	1.00	0.87	0.07	0.00318	0.02846	0.00	-0.0035
19	4	7.22	0.12	8.5	Sea	21.30	25.6	5.80	0.02	1.09	1.52	1.08	1.10	0.06	0.00310	0.04323	0.00	-0.0021
19	7	7.36	0.10	8.5	Sea	33.40	24.6	5.08	0.22	1.45	2.95	1.94	2.26	0.41	0.00556	0.07607	6.55	0.0008
19	10	6.93	0.09	9.8	Sea	24.00	61.2	4.67	0.02	1.01	1.37	0.92	1.16	0.04	0.00270	0.03739	0.00	-0.0027
19	13	6.66	0.54	8.5	Sea	26.40	11.1	28.64	0.58	2.63	8.04	7.55	2.79	3.41	0.01472	0.25130	16.31	0.0166
19	16	7.09	0.12	8.5	Sea	14.40	39.9	5.92	0.02	0.86	1.24	1.01	0.78	0.09	0.00343	0.02665	0.00	-0.0036
19	19	7.28	0.10	9.8	Sea	13.50	66.2	5.11	0.02	0.70	1.02	0.86	0.70	0.07	0.00317	0.01797	0.00	-0.0044
19	22	6.82	0.10	9.8	Sea	22.90	3.9	5.53	0.02	1.14	1.57	1.04	1.17	0.06	0.00305	0.04725	0.00	-0.0018
20	1	6.61	0.07	9.8	Sea	29.10	10.3	3.70	0.02	1.23	1.64	0.87	1.40	0.04	0.00269	0.05514	0.00	-0.0011
20	4	7.13	0.12	7.5	Sea	23.20	25.5	5.98	0.02	1.17	1.63	1.14	1.19	0.06	0.00306	0.04971	0.00	-0.0016
20	7	7.39	0.12	4.1	Bay	25.80	48.0	2.91	0.02	1.05	1.42	0.84	1.22	0.03	0.00257	0.03976	0.00	-0.0025
20	10	7.01	0.11	9.8	Sea	22.10	59.8	6.08	0.02	1.03	1.42	1.06	1.11	0.05	0.00292	0.03844	0.00	-0.0026
20	13	6.58	0.12	6.7	Sea	33.00	17.2	5.79	0.20	1.50	3.08	2.15	2.23	0.40	0.00552	0.08145	5.82	0.0013
20	16	6.95	0.13	8.5	Sea	23.30	86.6	6.82	0.02	0.97	1.36	1.12	1.13	0.04	0.00271	0.03419	0.00	-0.0030
20	19	7.40	0.25	3.9	Bay	12.60	86.9	5.38	0.02	0.68	1.11	1.06	0.66	0.07	0.00321	0.01683	0.00	-0.0045
20	22	6.98	0.24	4.1	Bay	21.50	64.6	6.51	0.02	1.06	1.56	1.29	1.09	0.06	0.00301	0.04104	0.00	-0.0023
21	1	6.73	0.25	3.9	Bay	38.70	15.4	6.26	0.12	1.75	3.30	2.29	2.40	0.24	0.00460	0.11110	3.41	0.0040
21	4	7.03	0.59	4.7	Bay	33.40	14.5	20.37	0.33	2.45	6.70	6.07	2.85	1.39	0.00920	0.21917	9.07	0.0137
21	7	7.50	0.92	5.6	Bay	6.30	63.6	35.48	0.47	2.63	9.17	9.15	0.75	5.25	0.01935	0.25140	13.18	0.0166
21	10	7.38	0.67	5.6	Bay	9.90	32.8	26.03	0.63	2.12	8.11	8.04	1.11	4.25	0.01684	0.16376	18.82	0.0087
21	13	6.71	0.39	5.6	Bay	37.00	62.2	16.62	0.41	2.05	5.81	5.32	3.07	1.21	0.00864	0.15267	12.18	0.0077
21	16	6.81	0.32	4.4	Bay	16.30	23.7	10.32	0.02	1.29	1.96	1.74	0.95	0.15	0.00399	0.06080	0.00	-0.0006
21	19	7.24	0.23	4.1	Bay	27.00	46.6	5.86	0.02	1.26	1.78	1.28	1.34	0.05	0.00287	0.05788	0.00	-0.0008
21	22	7.10	0.23	14.2	Sea	23.00	18.0	13.09	0.91	1.55	4.97	4.39	2.36	3.04	0.01377	0.08747	27.40	0.0018
22	1	6.56	0.19	9.8	Sea	23.80	30.2	10.72	0.53	1.44	4.15	3.64	2.11	1.64	0.00995	0.07576	15.98	0.0008
22	4	6.73	0.15	11.6	Sea	5.10	65.4	8.33	0.02	0.72	1.14	1.12	0.35	0.42	0.00563	0.01899	0.00	-0.0043
22	7	7.24	0.15	14.2	Sea	26.50	22.2	8.25	0.60	1.38	3.69	2.93	2.30	1.50	0.00952	0.06927	18.08	0.0002

22	10	7.23	0.13	11.6	Sea	21.80	29.4	7.24	0.02	1.17	1.62	1.18	1.15	0.08	0.00325	0.04963	0.00	-0.0016
22	13	6.64	0.12	11.6	Sea	27.80	28.7	6.75	0.02	1.33	1.82	1.19	1.41	0.06	0.00299	0.06482	0.00	-0.0002
22	16	6.58	0.11	9.8	Sea	26.20	55.7	5.87	0.02	1.16	1.58	1.08	1.29	0.04	0.00281	0.04907	0.00	-0.0016
22	19	7.13	0.19	6.1	Sea	21.10	14.1	8.07	0.02	1.27	1.82	1.42	1.14	0.09	0.00344	0.05832	0.00	-0.0008
22	22	7.18	0.24	5.1	Bay	17.10	68.4	8.85	0.02	1.06	1.62	1.47	0.94	0.10	0.00353	0.04070	0.00	-0.0024
23	1	6.69	0.22	6.1	Sea	24.20	2.9	10.16	0.31	1.51	3.95	3.44	1.93	1.00	0.00792	0.08254	9.22	0.0014
23	4	6.70	0.23	3.1	Bay	26.80	10.3	2.81	0.02	1.13	1.55	0.89	1.28	0.03	0.00263	0.04661	0.00	-0.0018
23	7	7.27	0.38	4.1	Bay	18.90	66.8	9.84	0.02	1.19	1.84	1.68	1.04	0.10	0.00355	0.05190	0.00	-0.0014
23	10	7.42	0.62	4.4	Bay	21.60	16.8	17.59	0.35	1.94	5.90	5.59	1.90	1.60	0.00984	0.13702	10.43	0.0063
23	13	6.87	0.75	9.8	Sea	27.30	69.9	40.39	0.54	2.96	9.12	8.92	3.04	4.14	0.01657	0.31813	14.73	0.0226
23	16	6.65	0.58	8.5	Sea	20.10	4.6	30.79	0.68	2.58	8.54	8.23	2.30	4.58	0.01768	0.24200	19.26	0.0158
23	19	7.16	0.69	9.8	Sea	17.00	16.5	36.44	0.66	2.77	9.01	8.77	2.09	5.83	0.02082	0.27895	18.45	0.0191
23	22	7.36	0.64	9.8	Sea	25.50	57.3	32.98	0.77	2.62	8.88	8.60	2.93	4.62	0.01779	0.24901	22.18	0.0164
24	1	6.90	0.62	11.6	Sea	19.20	46.9	34.35	1.02	2.57	9.35	9.12	2.50	6.91	0.02354	0.24095	29.64	0.0157
24	4	6.66	0.40	9.8	Sea	16.90	13.7	22.01	0.97	1.94	7.22	6.95	1.98	4.92	0.01852	0.13709	29.15	0.0063
24	7	7.22	0.59	9.8	Sea	14.30	27.5	30.96	1.16	2.37	9.40	9.23	1.90	7.38	0.02473	0.20476	33.97	0.0124
24	10	7.47	0.59	11.6	Sea	24.20	53.0	31.11	1.12	2.47	9.10	8.78	3.00	5.94	0.02109	0.22255	32.75	0.0140
24	13	6.99	0.44	9.8	Sea	17.00	60.9	23.67	1.06	1.90	7.58	7.44	2.03	5.28	0.01942	0.13122	31.63	0.0058
24	16	6.69	0.31	11.6	Sea	22.30	29.8	17.51	0.95	1.77	6.11	5.67	2.41	3.72	0.01551	0.11452	28.41	0.0043
24	19	7.11	0.35	8.5	Sea	8.10	22.8	18.03	0.77	1.49	5.89	5.82	0.93	4.58	0.01768	0.08106	22.97	0.0013
24	22	7.47	0.39	9.8	Sea	20.30	47.6	20.01	0.91	1.82	6.65	6.38	2.23	3.96	0.01612	0.12054	27.19	0.0048
25	1	7.10	0.27	9.8	Sea	16.50	53.8	14.18	0.72	1.36	4.87	4.68	1.68	2.93	0.01348	0.06739	21.66	0.0000
25	4	6.77	0.20	9.8	Sea	28.20	30.4	10.84	0.52	1.59	4.36	3.69	2.44	1.47	0.00943	0.09154	15.57	0.0022
25	7	7.15	0.23	9.8	Sea	15.30	77.2	12.28	0.02	1.12	1.69	1.60	0.90	0.17	0.00411	0.04534	0.00	-0.0019
25	10	7.55	0.28	9.8	Sea	12.70	40.3	14.22	0.02	1.31	1.96	1.82	0.82	0.31	0.00505	0.06288	0.00	-0.0004
25	13	7.21	0.24	11.6	Sea	13.10	27.9	12.82	0.02	1.24	1.82	1.64	0.83	0.28	0.00484	0.05637	0.00	-0.0010
25	16	6.86	0.24	9.8	Sea	24.00	74.1	12.75	0.02	1.35	1.94	1.71	1.30	0.09	0.00344	0.06582	0.00	-0.0001
25	19	7.17	0.23	8.5	Sea	21.00	49.8	11.45	0.02	1.35	1.95	1.66	1.18	0.12	0.00371	0.06604	0.00	-0.0001
25	22	7.56	0.29	8.5	Sea	14.20	11.0	14.09	0.61	1.41	4.85	4.64	1.43	2.80	0.01314	0.07252	18.35	0.0005
26	1	7.35	0.22	9.8	Sea	21.60	76.8	11.35	0.02	1.20	1.74	1.55	1.16	0.09	0.00340	0.05203	0.00	-0.0013
26	4	6.92	0.18	9.8	Sea	19.20	1.5	9.78	0.02	1.28	1.83	1.47	1.09	0.13	0.00379	0.05995	0.00	-0.0006
26	7	7.10	0.23	6.7	Sea	3.10	69.7	10.55	0.02	0.92	1.51	1.50	0.23	0.68	0.00673	0.03073	0.00	-0.0033
26	10	7.51	0.27	7.5	Sea	16.50	32.0	12.84	0.50	1.38	4.49	4.25	1.54	2.05	0.01114	0.06946	14.89	0.0002
26	13	7.28	0.24	9.8	Sea	19.00	62.9	12.72	0.02	1.29	1.89	1.70	1.09	0.14	0.00391	0.06078	0.00	-0.0006
26	16	6.77	0.18	9.8	Sea	22.40	5.2	9.86	0.50	1.39	3.91	3.38	1.96	1.56	0.00971	0.07009	14.94	0.0003
26	19	6.88	0.17	8.5	Sea	11.80	68.0	8.90	0.02	0.90	1.38	1.29	0.69	0.16	0.00408	0.02932	0.00	-0.0034
26	22	7.30	0.26	9.8	Sea	9.60	2.3	13.32	0.02	1.22	1.84	1.72	0.65	0.41	0.00557	0.05431	0.00	-0.0011
27	1	7.20	0.23	9.8	Sea	10.60	89.3	12.17	0.02	0.99	1.56	1.55	0.67	0.26	0.00477	0.03601	0.00	-0.0028
27	4	6.76	0.15	5.6	Bay	16.40	17.3	6.41	0.02	1.01	1.48	1.20	0.89	0.09	0.00345	0.03734	0.00	-0.0027
27	7	6.88	0.16	5.6	Bay	33.60	46.0	6.51	0.18	1.50	3.11	2.34	2.23	0.37	0.00534	0.08133	5.42	0.0013
27	10	7.27	0.25	5.1	Bay	21.70	67.8	9.17	0.02	1.19	1.77	1.54	1.15	0.08	0.00328	0.05170	0.00	-0.0014
27	13	7.11	0.19	5.6	Bay	20.40	15.3	7.78	0.02	1.23	1.78	1.41	1.10	0.09	0.00343	0.05512	0.00	-0.0011
27	16	6.69	0.12	5.6	Bay	29.60	3.6	5.06	0.15	1.36	2.69	1.89	1.91	0.31	0.00503	0.06700	4.37	0.0000
27	19	6.76	0.11	5.1	Bay	26.50	39.7	4.40	0.02	1.17	1.60	1.03	1.29	0.04	0.00275	0.04954	0.00	-0.0016
27	22	7.17	0.16	11.6	Sea	10.50	41.3	8.58	0.02	0.89	1.32	1.20	0.64	0.21	0.00439	0.02883	0.00	-0.0034
28	1	7.30	0.17	8.5	Sea	15.20	69.7	8.26	0.02	0.93	1.38	1.24	0.84	0.10	0.00356	0.03114	0.00	-0.0032
28	4	6.90	0.18	9.8	Sea	18.70	48.5	9.53	0.02	1.16	1.67	1.40	1.04	0.11	0.00363	0.04925	0.00	-0.0016
28	7	6.84	0.16	5.6	Bay	10.20	2.0	6.59	0.02	0.85	1.31	1.16	0.59	0.16	0.00402	0.02624	0.00	-0.0037
28	10	7.19	0.17	9.8	Sea	10.10	30.0	9.03	0.02	0.94	1.41	1.29	0.63	0.23	0.00458	0.03229	0.00	-0.0031
28	13	7.23	0.17	6.7	Sea	22.30	65.4	7.58	0.02	1.11	1.59	1.30	1.14	0.06	0.00306	0.04469	0.00	-0.0020
28	16	6.81	0.15	6.7	Sea	21.30	35.5	7.21	0.02	1.17	1.67	1.29	1.12	0.08	0.00325	0.04983	0.00	-0.0015
28	19	6.74	0.14	11.6	Sea	14.20	24.3	7.65	0.02	0.97	1.39	1.15	0.81	0.13	0.00382	0.03397	0.00	-0.0030
28	22	7.06	0.12	11.6	Sea	8.40	41.3	6.57	0.02	0.71	1.07	0.97	0.50	0.19	0.00429	0.01829	0.00	-0.0044
29	1	7.25	0.15	9.8	Sea	21.80	63.4	7.94	0.02	1.10	1.55	1.25	1.13	0.07	0.00312	0.04395	0.00	-0.0021
29	4	6.96	0.15	11.6	Sea	17.40	29.6	8.23	0.02	1.09	1.55	1.24	0.97	0.11	0.00363	0.04315	0.00	-0.0021
29	7	6.77	0.11	9.8	Sea	18.60	42.3	6.21	0.02	0.99	1.39	1.06	0.97	0.07	0.00320	0.03537	0.00	-0.0028
29	10	6.98	0.13	11.6	Sea	19.40	69.4	7.28	0.02	0.96	1.35	1.11	1.00	0.06	0.00309	0.03346	0.00	-0.0030
29	13	7.14	0.15	9.8	Sea	7.50	43.3	7.75	0.02	0.78	1.20	1.12	0.47	0.26	0.00475	0.02185	0.00	-0.0041
29	16	6.86	0.10	9.8	Sea	19.00	2.1	5.57	0.02	1.02	1.42	1.01	0.99	0.07	0.00320	0.03748	0.00	-0.0027
29	19	6.66	0.10	9.8	Sea	25.80	21.9	5.61	0.02	1.22	1.67	1.08	1.30	0.05	0.00294	0.05451	0.00	-0.0011

29	22	6.89	0.12	11.6	Sea	19.40	64.4	6.50	0.02	0.94	1.32	1.04	0.99	0.06	0.00303	0.03228	0.00	-0.0031
30	1	7.18	0.12	8.5	Sea	13.10	58.3	6.27	0.02	0.79	1.18	1.03	0.71	0.10	0.00349	0.02295	0.00	-0.0040
30	4	6.95	0.12	9.8	Sea	19.90	46.9	6.49	0.02	1.03	1.44	1.10	1.03	0.07	0.00315	0.03848	0.00	-0.0026
30	7	6.65	0.13	8.5	Sea	21.70	38.8	6.81	0.02	1.13	1.59	1.19	1.13	0.07	0.00316	0.04681	0.00	-0.0018
30	10	6.72	0.17	9.8	Sea	10.70	20.6	9.19	0.02	0.98	1.46	1.31	0.66	0.23	0.00454	0.03493	0.00	-0.0029
30	13	6.93	0.12	11.6	Sea	11.20	36.8	6.81	0.02	0.81	1.18	1.02	0.65	0.14	0.00393	0.02367	0.00	-0.0039
30	16	6.83	0.12	9.8	Sea	4.40	17.3	6.72	0.02	0.65	1.03	0.99	0.29	0.38	0.00543	0.01551	0.00	-0.0046
30	19	6.64	0.11	9.8	Sea	13.80	20.1	6.17	0.02	0.88	1.27	1.02	0.76	0.11	0.00359	0.02802	0.00	-0.0035
30	22	6.83	0.13	11.6	Sea	13.10	82.2	7.03	0.02	0.73	1.09	1.01	0.71	0.09	0.00341	0.01947	0.00	-0.0043
31	1	7.25	0.18	7.5	Sea	11.80	14.8	8.74	0.02	1.01	1.52	1.35	0.71	0.19	0.00427	0.03723	0.00	-0.0027
31	4	7.31	0.21	8.5	Sea	19.70	16.7	10.45	0.02	1.34	1.92	1.58	1.12	0.13	0.00382	0.06552	0.00	-0.0001
31	7	6.89	0.18	8.5	Sea	18.20	43.0	9.62	0.02	1.19	1.72	1.45	1.02	0.12	0.00371	0.05114	0.00	-0.0014
31	10	6.93	0.15	11.6	Sea	8.20	14.8	8.30	0.02	0.84	1.27	1.16	0.52	0.28	0.00485	0.02586	0.00	-0.0037
31	13	7.12	0.14	9.8	Sea	10.30	52.6	7.19	0.02	0.79	1.19	1.08	0.60	0.16	0.00405	0.02250	0.00	-0.0040
31	16	7.09	0.12	9.8	Sea	25.60	49.3	6.36	0.02	1.19	1.63	1.14	1.28	0.05	0.00291	0.05157	0.00	-0.0014
31	19	6.81	0.11	9.8	Sea	38.60	31.8	5.81	0.28	1.64	3.42	2.20	2.70	0.49	0.00595	0.09785	8.23	0.0028
31	22	6.78	0.10	11.6	Sea	28.20	20.0	5.66	0.02	1.30	1.76	1.08	1.41	0.05	0.00289	0.06164	0.00	-0.0005

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8902

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
32	1	7.09	0.14	8.5	Sea	18.20	47.8	7.30	0.02	1.03	1.48	1.20	0.97	0.08	0.00335	0.03863	0.00	-0.0026
32	4	7.27	0.14	8.5	Sea	19.30	23.3	6.93	0.02	1.10	1.56	1.19	1.03	0.08	0.00335	0.04405	0.00	-0.0021
32	7	6.93	0.12	8.5	Sea	13.20	13.7	6.06	0.02	0.87	1.26	1.03	0.73	0.11	0.00363	0.02730	0.00	-0.0036
32	10	6.72	0.09	8.5	Sea	13.20	49.7	4.49	0.02	0.71	1.03	0.83	0.69	0.07	0.00319	0.01832	0.00	-0.0044
32	13	6.90	0.13	9.8	Sea	18.70	45.0	6.73	0.02	1.01	1.43	1.11	0.99	0.08	0.00325	0.03725	0.00	-0.0027
32	16	7.07	0.20	6.1	Bay	6.50	11.0	8.74	0.02	0.89	1.42	1.36	0.42	0.33	0.00512	0.02908	0.00	-0.0034
32	19	6.86	0.13	7.5	Sea	35.20	3.6	6.64	0.24	1.63	3.48	2.44	2.48	0.51	0.00605	0.09637	7.22	0.0026
32	22	6.64	0.12	6.1	Sea	28.00	46.1	5.34	0.02	1.24	1.71	1.13	1.37	0.04	0.00279	0.05638	0.00	-0.0010
33	1	6.96	0.16	6.7	Sea	11.20	62.4	7.52	0.02	0.84	1.30	1.20	0.64	0.14	0.00392	0.02538	0.00	-0.0037
33	4	7.31	0.19	4.1	Bay	14.80	65.2	4.93	0.02	0.78	1.18	1.02	0.76	0.06	0.00310	0.02201	0.00	-0.0040
33	7	7.10	0.15	7.5	Sea	13.10	32.1	7.56	0.02	0.95	1.41	1.22	0.75	0.14	0.00387	0.03272	0.00	-0.0031
33	10	6.70	0.13	6.7	Sea	14.90	12.4	6.24	0.02	0.95	1.38	1.12	0.82	0.10	0.00353	0.03260	0.00	-0.0031
33	13	6.81	0.12	8.5	Sea	24.50	46.0	6.39	0.02	1.18	1.63	1.16	1.24	0.05	0.00297	0.05031	0.00	-0.0015
33	16	7.13	0.16	4.7	Bay	5.30	34.1	5.43	0.02	0.63	1.05	1.01	0.32	0.21	0.00445	0.01456	0.00	-0.0047
33	19	7.06	0.15	4.7	Bay	18.60	11.0	5.15	0.02	1.01	1.46	1.10	0.96	0.07	0.00315	0.03718	0.00	-0.0027
33	22	6.75	0.11	5.6	Bay	31.60	5.4	4.63	0.13	1.40	2.66	1.77	1.99	0.26	0.00475	0.07085	3.96	0.0003
34	1	7.01	0.13	6.7	Sea	17.80	61.0	6.03	0.02	0.91	1.32	1.08	0.92	0.06	0.00311	0.03033	0.00	-0.0033
34	4	7.46	0.15	6.1	Sea	18.00	26.9	6.30	0.02	1.04	1.50	1.18	0.96	0.08	0.00332	0.03902	0.00	-0.0025
34	7	7.43	0.10	9.8	Sea	34.00	55.5	5.10	0.26	1.38	2.84	1.93	2.32	0.42	0.00562	0.06919	7.74	0.0002
34	10	7.00	0.14	8.5	Sea	16.10	54.5	7.05	0.02	0.93	1.36	1.14	0.87	0.09	0.00341	0.03174	0.00	-0.0032
34	13	6.90	0.18	7.5	Sea	10.20	25.4	9.10	0.02	0.98	1.50	1.37	0.63	0.23	0.00454	0.03502	0.00	-0.0029
34	16	7.41	0.24	7.5	Bay	12.40	13.5	11.50	0.02	1.21	1.82	1.65	0.77	0.25	0.00467	0.05329	0.00	-0.0012
34	19	7.55	0.91	4.7	Bay	3.20	23.0	28.51	0.57	2.23	8.74	8.73	0.37	4.80	0.01823	0.18106	17.19	0.0103
34	22	7.12	0.71	5.1	Bay	31.50	53.8	26.41	0.38	2.56	7.60	7.25	2.87	1.87	0.01061	0.23847	10.29	0.0154
35	1	7.16	0.91	5.6	Bay	35.70	23.1	36.57	0.19	3.43	8.10	7.51	3.13	1.56	0.00970	0.42807	3.59	0.0325
35	4	7.67	0.64	4.7	Bay	22.50	56.9	19.78	0.42	1.95	6.43	6.23	2.06	1.90	0.01071	0.13775	12.60	0.0064
35	7	7.87	0.76	5.1	Bay	15.60	26.5	25.19	0.55	2.22	7.92	7.77	1.63	3.26	0.01434	0.17985	16.42	0.0102
35	10	7.32	0.57	5.1	Bay	25.70	84.1	20.47	0.48	1.83	6.52	6.45	2.36	1.93	0.01079	0.12238	14.42	0.0050
35	13	6.93	0.29	4.7	Bay	29.10	42.0	10.29	0.24	1.60	3.97	3.46	2.16	0.68	0.00676	0.09359	7.08	0.0024
35	16	7.28	0.26	7.5	Sea	11.80	5.5	12.65	0.02	1.27	1.92	1.76	0.76	0.30	0.00496	0.05892	0.00	-0.0007
35	19	7.53	0.26	7.5	Sea	21.20	74.2	12.06	0.02	1.27	1.88	1.71	1.17	0.10	0.00357	0.05874	0.00	-0.0007
35	22	7.06	0.20	3.5	Bay	20.00	30.8	3.31	0.02	0.92	1.30	0.89	0.98	0.04	0.00279	0.03075	0.00	-0.0033
36	1	6.77	0.18	8.5	Sea	29.00	6.3	9.31	0.39	1.58	3.98	3.23	2.34	1.05	0.00810	0.09043	11.60	0.0021
36	4	7.30	0.19	7.5	Sea	16.60	13.1	9.04	0.02	1.17	1.71	1.43	0.95	0.14	0.00385	0.05011	0.00	-0.0015
36	7	7.73	0.19	8.5	Sea	21.70	10.5	9.01	0.02	1.32	1.87	1.45	1.19	0.10	0.00353	0.06356	0.00	-0.0003
36	10	7.39	0.33	4.1	Bay	16.80	33.9	8.36	0.02	1.16	1.75	1.52	0.93	0.11	0.00365	0.04877	0.00	-0.0016
36	13	6.82	0.28	4.1	Bay	31.80	82.6	7.96	0.02	1.32	1.87	1.52	1.53	0.04	0.00269	0.06374	0.00	-0.0003
36	16	7.14	0.19	7.5	Bay	22.60	9.8	9.33	0.36	1.38	3.69	3.20	1.85	1.13	0.00837	0.06933	10.82	0.0002
36	19	7.59	0.22	7.5	Sea	19.50	29.6	10.42	0.02	1.32	1.91	1.60	1.10	0.13	0.00379	0.06352	0.00	-0.0003
36	22	7.26	0.24	8.5	Sea	13.00	66.3	12.16	0.02	1.13	1.73	1.64	0.80	0.22	0.00449	0.04667	0.00	-0.0018
37	1	6.72	0.13	9.8	Sea	30.10	31.3	6.84	0.34	1.42	3.30	2.48	2.27	0.75	0.00701	0.07305	10.28	0.0005
37	4	7.05	0.19	8.5	Sea	20.20	47.4	9.73	0.02	1.23	1.78	1.48	1.11	0.10	0.00356	0.05537	0.00	-0.0010
37	7	7.66	0.16	5.6	Bay	29.90	12.4	6.11	0.17	1.43	2.99	2.22	2.01	0.39	0.00548	0.07436	5.17	0.0007
37	10	7.46	0.15	9.8	Sea	25.80	12.8	7.80	0.40	1.37	3.45	2.77	2.07	1.03	0.00803	0.06799	11.89	0.0001
37	13	6.71	0.08	8.5	Sea	31.80	19.5	4.44	0.20	1.36	2.71	1.73	2.11	0.36	0.00530	0.06755	5.87	0.0001
37	16	6.85	0.08	8.5	Sea	21.70	30.4	4.38	0.02	1.01	1.39	0.91	1.08	0.05	0.00288	0.03701	0.00	-0.0027
37	19	7.52	0.15	6.1	Sea	23.90	16.7	6.34	0.02	1.24	1.74	1.24	1.23	0.06	0.00311	0.05590	0.00	-0.0010
37	22	7.37	0.13	8.5	Sea	15.40	44.4	6.57	0.02	0.91	1.33	1.09	0.83	0.09	0.00344	0.03045	0.00	-0.0033
38	1	6.73	0.07	8.5	Sea	29.50	33.0	3.80	0.02	1.23	1.64	0.90	1.41	0.03	0.00265	0.05487	0.00	-0.0011
38	4	6.82	0.07	7.5	Bay	22.20	9.4	3.26	0.02	0.98	1.34	0.79	1.08	0.04	0.00276	0.03501	0.00	-0.0029

38	7	7.57	0.14	6.1	Sea	14.00	4.8	5.93	0.02	0.91	1.34	1.10	0.77	0.10	0.00354	0.03002	0.00	-0.0033
38	10	7.72	0.48	4.4	Bay	11.10	43.0	13.03	0.02	1.31	2.09	1.99	0.71	0.28	0.00489	0.06288	0.00	-0.0004
38	13	6.93	0.54	4.4	Bay	36.00	44.2	16.75	0.32	2.20	5.93	5.35	2.90	1.05	0.00811	0.17558	9.46	0.0098
38	16	6.83	0.37	4.4	Bay	28.60	0.1	11.91	0.24	1.79	4.52	3.95	2.19	0.81	0.00727	0.11689	7.29	0.0045
38	19	7.45	0.22	6.1	Bay	21.60	31.9	9.28	0.02	1.33	1.92	1.56	1.18	0.10	0.00351	0.06399	0.00	-0.0003
38	22	7.57	0.16	6.1	Bay	16.10	46.7	6.51	0.02	0.95	1.40	1.17	0.86	0.09	0.00338	0.03267	0.00	-0.0031
39	1	6.95	0.15	9.8	Sea	32.20	5.1	8.20	0.39	1.61	3.87	2.92	2.53	0.93	0.00769	0.09385	11.72	0.0024
39	4	6.77	0.09	3.1	Bay	17.40	28.9	1.04	0.02	0.68	0.91	0.46	0.80	0.03	0.00247	0.01665	0.00	-0.0045
39	7	7.42	0.21	3.9	Bay	22.10	76.5	4.41	0.02	0.92	1.30	1.01	1.06	0.03	0.00265	0.03047	0.00	-0.0033
39	10	7.68	0.14	4.7	Bay	17.70	25.2	4.40	0.02	0.92	1.32	0.98	0.90	0.06	0.00304	0.03047	0.00	-0.0033
39	13	7.00	0.17	8.5	Sea	17.60	20.7	9.00	0.02	1.18	1.70	1.40	0.99	0.12	0.00376	0.05083	0.00	-0.0015
39	16	6.60	0.06	3.1	Bay	29.40	9.9	0.74	0.02	1.07	1.40	0.44	1.33	0.02	0.00236	0.04164	0.00	-0.0023
39	19	7.19	0.16	6.7	Sea	20.80	24.7	7.47	0.02	1.20	1.71	1.32	1.11	0.08	0.00335	0.05195	0.00	-0.0014
39	22	7.53	0.10	6.1	Bay	15.10	27.4	4.18	0.02	0.80	1.16	0.88	0.78	0.06	0.00312	0.02347	0.00	-0.0039
40	1	6.99	0.15	3.7	Bay	29.20	73.6	3.11	0.02	1.10	1.47	0.89	1.34	0.02	0.00244	0.04400	0.00	-0.0021
40	4	6.65	0.15	3.1	Bay	21.00	9.9	1.84	0.02	0.87	1.19	0.66	0.99	0.03	0.00258	0.02730	0.00	-0.0036
40	7	7.04	0.44	3.9	Bay	27.70	19.3	10.37	0.19	1.66	4.00	3.48	2.01	0.61	0.00648	0.09999	5.76	0.0030
40	10	7.55	0.36	4.1	Bay	10.20	81.0	8.84	0.02	0.91	1.52	1.49	0.60	0.18	0.00418	0.03014	0.00	-0.0033
40	13	7.08	0.26	4.4	Bay	26.60	81.3	7.97	0.02	1.18	1.71	1.46	1.31	0.05	0.00284	0.05095	0.00	-0.0014
40	16	6.51	0.22	3.9	Bay	25.60	10.5	5.84	0.02	1.30	1.84	1.30	1.30	0.06	0.00301	0.06108	0.00	-0.0005
40	19	6.84	0.17	4.4	Bay	20.00	13.7	5.35	0.02	1.07	1.54	1.15	1.03	0.06	0.00312	0.04178	0.00	-0.0023
40	22	7.34	0.07	4.1	Bay	32.90	0.2	1.80	0.02	1.26	1.67	0.69	1.52	0.03	0.00246	0.05786	0.00	-0.0008
41	1	7.08	0.09	11.6	Sea	31.60	18.2	4.87	0.29	1.37	2.91	1.88	2.25	0.54	0.00618	0.06843	8.75	0.0001
41	4	6.43	0.05	9.8	Sea	29.10	7.9	2.92	0.02	1.18	1.57	0.76	1.38	0.03	0.00260	0.05108	0.00	-0.0014
41	7	6.53	0.09	8.5	Sea	12.30	50.1	4.79	0.02	0.70	1.03	0.85	0.65	0.08	0.00332	0.01789	0.00	-0.0044
41	10	7.10	0.14	3.5	Bay	21.00	79.3	2.33	0.02	0.79	1.06	0.70	0.96	0.02	0.00243	0.02246	0.00	-0.0040
41	13	6.99	0.14	3.7	Bay	11.60	57.8	2.87	0.02	0.58	0.87	0.73	0.58	0.05	0.00293	0.01208	0.00	-0.0049
41	16	6.50	0.11	3.7	Bay	29.70	47.0	2.58	0.02	1.16	1.56	0.83	1.38	0.03	0.00250	0.04913	0.00	-0.0016
41	19	6.63	0.11	3.3	Bay	8.60	37.3	1.64	0.02	0.43	0.65	0.51	0.43	0.05	0.00285	0.00665	0.00	-0.0054
41	22	7.26	0.07	11.6	Sea	27.60	66.6	3.77	0.02	1.07	1.42	0.81	1.29	0.03	0.00251	0.04177	0.00	-0.0023
42	1	7.25	0.05	9.8	Sea	22.30	10.9	2.46	0.02	0.93	1.24	0.64	1.06	0.03	0.00263	0.03116	0.00	-0.0032
42	4	6.62	0.09	9.8	Sea	14.40	3.7	4.75	0.02	0.81	1.16	0.87	0.76	0.08	0.00330	0.02414	0.00	-0.0039
42	7	6.49	0.11	9.8	Sea	16.60	12.3	5.98	0.02	0.96	1.36	1.03	0.89	0.09	0.00338	0.03351	0.00	-0.0030
42	10	6.94	0.14	4.4	Bay	13.40	34.2	4.34	0.02	0.77	1.15	0.94	0.70	0.07	0.00322	0.02155	0.00	-0.0041
42	13	7.01	0.12	3.5	Bay	16.10	78.1	2.02	0.02	0.62	0.86	0.61	0.75	0.03	0.00248	0.01391	0.00	-0.0048
42	16	6.52	0.10	9.8	Sea	25.40	39.7	5.41	0.02	1.16	1.58	1.04	1.26	0.05	0.00287	0.04916	0.00	-0.0016
42	19	6.46	0.07	5.1	Bay	24.10	40.7	2.75	0.02	0.99	1.34	0.77	1.14	0.03	0.00260	0.03554	0.00	-0.0028
42	22	7.03	0.12	8.5	Sea	22.10	24.3	6.36	0.02	1.15	1.61	1.15	1.15	0.07	0.00315	0.04832	0.00	-0.0017
43	1	7.26	0.10	3.7	Bay	24.80	62.3	1.85	0.02	0.93	1.24	0.65	1.14	0.02	0.00242	0.03151	0.00	-0.0032
43	4	6.85	0.08	9.8	Sea	15.70	14.5	4.54	0.02	0.84	1.18	0.85	0.82	0.07	0.00318	0.02554	0.00	-0.0037
43	7	6.52	0.05	9.8	Sea	22.80	19.3	2.90	0.02	0.96	1.29	0.71	1.09	0.04	0.00268	0.03384	0.00	-0.0030
43	10	6.88	0.11	8.5	Sea	10.30	36.3	5.62	0.02	0.73	1.09	0.94	0.58	0.13	0.00377	0.01914	0.00	-0.0043
43	13	7.25	0.10	14.2	Sea	12.50	4.6	5.37	0.02	0.78	1.10	0.86	0.69	0.11	0.00358	0.02192	0.00	-0.0041
43	16	6.93	0.32	4.1	Bay	17.00	70.0	8.91	0.02	1.08	1.68	1.55	0.93	0.10	0.00354	0.04205	0.00	-0.0022
43	19	6.67	0.22	4.4	Bay	29.20	53.3	7.37	0.17	1.39	3.07	2.57	1.96	0.39	0.00546	0.07008	5.00	0.0003
43	22	7.05	0.11	3.9	Bay	18.10	21.8	2.62	0.02	0.81	1.14	0.75	0.88	0.04	0.00275	0.02415	0.00	-0.0039
44	1	7.54	0.19	4.1	Bay	26.10	31.1	4.56	0.02	1.19	1.66	1.10	1.28	0.04	0.00281	0.05177	0.00	-0.0014
44	4	7.34	0.31	4.7	Bay	25.00	14.7	10.16	0.24	1.55	3.91	3.43	1.90	0.77	0.00711	0.08702	7.09	0.0018
44	7	6.86	0.23	3.9	Bay	24.20	56.0	5.77	0.02	1.14	1.63	1.24	1.20	0.05	0.00289	0.04712	0.00	-0.0018
44	10	6.97	0.20	3.7	Bay	3.00	10.3	4.08	0.02	0.50	0.89	0.87	0.18	0.22	0.00447	0.00922	0.00	-0.0052
44	16	7.09	0.16	11.6	Sea	16.00	82.4	8.74	0.02	0.88	1.31	1.20	0.86	0.09	0.00341	0.02849	0.00	-0.0035
44	19	6.75	0.15	9.8	Sea	12.40	74.8	8.35	0.02	0.84	1.27	1.19	0.71	0.13	0.00383	0.02552	0.00	-0.0037
44	22	6.70	0.17	9.8	Sea	16.40	50.2	9.32	0.02	1.08	1.57	1.36	0.93	0.13	0.00376	0.04257	0.00	-0.0022
45	1	7.22	0.24	4.1	Bay	16.60	5.5	6.15	0.02	1.03	1.53	1.25	0.89	0.09	0.00340	0.03870	0.00	-0.0025
45	4	7.26	0.21	4.7	Bay	30.30	79.1	6.80	0.02	1.25	1.73	1.34	1.45	0.04	0.00266	0.05649	0.00	-0.0009
45	7	6.92	0.18	6.1	Bay	26.40	31.1	7.96	0.25	1.39	3.34	2.78	1.95	0.66	0.00668	0.07071	7.46	0.0003
45	10	6.72	0.17	6.1	Bay	26.90	46.6	7.57	0.02	1.33	1.87	1.39	1.37	0.06	0.00304	0.06483	0.00	-0.0002
45	13	6.98	0.25	6.7	Sea	20.90	62.6	11.54	0.02	1.31	1.94	1.72	1.16	0.11	0.00363	0.06273	0.00	-0.0004
45	16	7.09	0.26	6.1	Sea	11.80	0.2	11.38	0.02	1.22	1.86	1.70	0.74	0.25	0.00470	0.05386	0.00	-0.0012
45	19	6.84	0.23	7.5	Sea	4.70	8.0	11.36	0.02	1.01	1.60	1.57	0.34	0.60	0.00642	0.03714	0.00	-0.0027

45	22	6.64	0.16	4.7	Bay	22.60	32.1	5.86	0.02	1.16	1.65	1.22	1.15	0.06	0.00305	0.04860	0.00	-0.0017
46	1	7.02	0.27	5.6	Bay	17.40	75.0	11.23	0.02	1.17	1.81	1.70	0.98	0.13	0.00378	0.05004	0.00	-0.0015
46	4	7.28	0.28	6.1	Sea	14.80	46.1	11.94	0.02	1.27	1.93	1.77	0.89	0.19	0.00432	0.05857	0.00	-0.0008
46	7	7.07	0.23	4.4	Bay	30.80	65.8	6.92	0.02	1.35	1.88	1.40	1.50	0.04	0.00277	0.06623	0.00	-0.0001
46	10	6.64	0.15	8.5	Sea	16.10	9.9	8.04	0.02	1.09	1.57	1.28	0.91	0.12	0.00375	0.04293	0.00	-0.0022
46	13	6.73	0.18	9.8	Sea	12.90	68.1	9.62	0.02	0.95	1.44	1.33	0.75	0.16	0.00406	0.03288	0.00	-0.0031
46	16	7.03	0.20	5.6	Bay	14.90	21.1	8.06	0.02	1.08	1.61	1.38	0.84	0.13	0.00380	0.04218	0.00	-0.0022
46	19	6.89	0.19	9.8	Sea	21.20	59.2	10.03	0.02	1.22	1.74	1.46	1.15	0.09	0.00344	0.05372	0.00	-0.0012
46	22	6.50	0.13	9.8	Sea	20.70	12.4	6.98	0.02	1.15	1.61	1.18	1.10	0.08	0.00332	0.04835	0.00	-0.0017
47	1	6.79	0.18	6.1	Bay	28.80	15.4	8.27	0.25	1.52	3.57	2.89	2.12	0.66	0.00668	0.08428	7.48	0.0016
47	4	7.23	0.33	5.6	Bay	16.00	47.1	13.23	0.38	1.39	4.51	4.35	1.42	1.64	0.00994	0.07050	11.32	0.0003
47	7	7.24	0.24	5.6	Bay	19.70	65.4	9.48	0.02	1.16	1.74	1.54	1.07	0.09	0.00345	0.04937	0.00	-0.0016
47	10	6.83	0.20	3.1	Bay	17.30	71.2	2.31	0.02	0.69	0.96	0.69	0.81	0.03	0.00254	0.01725	0.00	-0.0045
47	13	6.83	0.25	3.7	Bay	18.80	23.8	5.25	0.02	1.03	1.50	1.17	0.97	0.07	0.00313	0.03835	0.00	-0.0026
47	16	7.26	0.42	4.1	Bay	16.40	66.9	10.87	0.02	1.21	1.90	1.78	0.94	0.14	0.00387	0.05316	0.00	-0.0012
47	19	7.25	0.27	4.4	Bay	13.50	0.7	7.80	0.02	1.05	1.61	1.41	0.77	0.14	0.00388	0.04035	0.00	-0.0024
47	22	6.76	0.18	6.7	Bay	25.10	75.6	8.46	0.02	1.17	1.68	1.40	1.26	0.05	0.00296	0.05020	0.00	-0.0015
48	1	6.81	0.22	8.5	Sea	22.60	15.0	11.68	0.50	1.51	4.40	3.92	2.02	1.69	0.01010	0.08282	14.82	0.0014
48	4	7.35	0.47	4.4	Bay	21.40	64.4	13.64	0.30	1.50	4.62	4.45	1.75	1.14	0.00840	0.08190	8.97	0.0013
48	7	7.52	0.35	4.7	Bay	26.80	11.6	11.03	0.25	1.66	4.22	3.69	2.06	0.82	0.00729	0.10066	7.48	0.0030
48	10	7.19	0.66	4.4	Bay	23.20	10.7	19.54	0.37	2.12	6.49	6.15	2.09	1.75	0.01028	0.16375	11.19	0.0087
48	13	6.88	0.49	4.4	Bay	14.80	89.7	15.49	0.35	1.38	5.04	5.03	1.31	1.65	0.00997	0.06939	10.53	0.0002
48	16	7.18	0.42	6.7	Bay	12.90	37.9	19.09	0.61	1.69	6.21	6.09	1.35	3.32	0.01450	0.10393	18.29	0.0033
48	19	7.35	0.29	9.8	Sea	25.40	25.2	15.29	0.70	1.77	5.55	5.01	2.48	2.49	0.01234	0.11427	21.00	0.0043
48	22	6.96	0.24	11.6	Sea	24.20	40.2	13.03	0.75	1.54	4.83	4.35	2.34	2.40	0.01208	0.08611	22.38	0.0017
49	1	6.75	0.23	3.1	Bay	18.90	51.8	2.65	0.02	0.80	1.13	0.78	0.90	0.03	0.00265	0.02354	0.00	-0.0039
49	4	7.19	0.31	9.8	Sea	18.70	52.7	16.49	0.80	1.55	5.59	5.36	1.96	3.27	0.01438	0.08786	23.88	0.0019
49	7	7.54	0.44	11.6	Sea	28.00	34.0	23.30	1.15	2.25	7.92	7.34	3.21	4.57	0.01766	0.18358	34.40	0.0105
49	10	7.27	0.64	4.4	Bay	23.60	24.6	18.84	0.36	2.06	6.28	5.95	2.09	1.65	0.00999	0.15458	10.91	0.0079
49	13	6.88	0.69	4.7	Bay	23.60	63.9	24.41	0.49	2.22	7.70	7.54	2.28	2.39	0.01207	0.17875	14.76	0.0101
49	16	7.16	0.82	7.5	Bay	19.10	29.8	39.90	0.36	3.07	8.76	8.53	2.10	3.95	0.01610	0.34333	9.19	0.0249
49	19	7.52	0.85	7.5	Bay	16.70	25.9	39.60	0.39	3.01	8.84	8.65	1.89	4.38	0.01719	0.32912	10.14	0.0236
49	22	7.24	0.82	9.8	Sea	24.70	83.4	42.94	0.58	2.94	9.53	9.46	2.87	4.81	0.01826	0.31514	16.03	0.0223
50	1	6.81	0.80	9.8	Sea	22.00	71.4	43.27	0.52	3.03	9.37	9.25	2.58	4.98	0.01869	0.33305	14.07	0.0239
50	4	7.10	1.06	4.7	Bay	16.00	39.8	35.96	0.28	2.90	8.46	8.34	1.63	2.92	0.01347	0.30620	6.94	0.0215
50	7	7.55	0.79	8.5	Sea	24.70	45.4	38.67	0.41	3.03	8.70	8.40	2.66	3.63	0.01530	0.33416	10.80	0.0240
50	10	7.38	0.58	11.6	Sea	33.00	80.8	30.85	1.33	2.38	9.35	9.14	3.92	5.18	0.01919	0.20645	39.18	0.0126
50	13	6.76	0.52	11.6	Sea	21.10	32.6	29.36	1.23	2.40	9.02	8.67	2.70	6.55	0.02262	0.20950	35.95	0.0128
50	16	6.88	0.39	9.8	Sea	7.40	7.2	21.09	1.00	1.65	6.79	6.72	0.94	6.33	0.02208	0.09862	29.84	0.0028
50	19	7.37	0.42	9.8	Sea	17.70	23.9	21.62	0.96	1.92	7.12	6.84	2.04	4.70	0.01799	0.13472	28.74	0.0061
50	22	7.22	0.36	11.6	Sea	15.60	28.2	19.41	1.07	1.70	6.47	6.23	1.85	5.12	0.01904	0.10533	32.02	0.0035
51	1	6.67	0.22	11.6	Sea	20.60	10.9	12.28	0.72	1.46	4.59	4.13	2.02	2.53	0.01243	0.07727	21.55	0.0009
51	4	6.83	0.25	9.8	Sea	11.80	57.4	13.38	0.02	1.20	1.81	1.71	0.76	0.30	0.00498	0.05213	0.00	-0.0013
51	7	7.38	0.32	9.8	Sea	18.30	24.3	16.69	0.79	1.65	5.73	5.42	1.93	3.41	0.01472	0.09896	23.60	0.0029
51	10	7.33	0.25	11.6	Sea	22.80	76.7	13.24	0.02	1.31	1.88	1.69	1.25	0.10	0.00352	0.06210	0.00	-0.0004
51	13	6.71	0.17	11.6	Sea	21.80	12.7	9.36	0.02	1.32	1.85	1.41	1.20	0.10	0.00357	0.06343	0.00	-0.0003
51	16	6.69	0.14	8.5	Sea	20.20	23.9	7.68	0.02	1.17	1.66	1.28	1.09	0.09	0.00341	0.05018	0.00	-0.0015
51	19	7.25	0.21	9.8	Sea	14.20	48.4	11.13	0.02	1.14	1.69	1.52	0.85	0.19	0.00429	0.04728	0.00	-0.0018
51	22	7.25	0.22	11.6	Sea	20.20	8.5	12.08	0.71	1.44	4.52	4.07	1.98	2.51	0.01239	0.07496	21.34	0.0007
52	1	6.74	0.16	11.6	Sea	20.70	6.9	9.22	0.02	1.28	1.80	1.39	1.15	0.11	0.00362	0.05980	0.00	-0.0006
52	4	6.67	0.16	9.8	Sea	18.70	37.4	8.74	0.02	1.15	1.64	1.34	1.03	0.11	0.00358	0.04830	0.00	-0.0017
52	7	7.16	0.26	8.5	Sea	19.50	87.8	13.33	0.02	1.20	1.82	1.75	1.09	0.12	0.00370	0.05261	0.00	-0.0013
52	10	7.22	0.31	9.8	Sea	30.00	0.2	16.29	0.71	2.01	6.06	5.32	2.91	2.44	0.01218	0.14699	21.28	0.0072
52	13	6.66	0.41	3.7	Bay	22.80	48.3	9.15	0.02	1.35	2.01	1.70	1.22	0.09	0.00336	0.06611	0.00	-0.0001
52	16	6.49	0.23	6.1	Bay	20.30	36.4	10.79	0.34	1.37	3.93	3.62	1.68	1.20	0.00858	0.06839	10.17	0.0001
52	19	6.94	0.39	5.6	Bay	16.90	0.9	16.28	0.43	1.69	5.47	5.24	1.58	2.06	0.01115	0.10451	12.87	0.0034
52	22	7.26	0.31	9.8	Sea	10.30	44.0	16.29	0.83	1.38	5.41	5.32	1.16	4.32	0.01703	0.06922	24.74	0.0002
53	1	6.70	0.20	9.8	Sea	14.50	77.8	10.75	0.02	1.01	1.53	1.44	0.84	0.15	0.00396	0.03697	0.00	-0.0027
53	4	6.50	0.13	8.5	Sea	33.80	30.0	7.23	0.30	1.57	3.54	2.61	2.48	0.65	0.00661	0.08978	9.03	0.0021
53	7	7.02	0.29	8.5	Sea	19.30	47.0	14.79	0.63	1.51	5.10	4.84	1.88	2.48	0.01229	0.08321	18.75	0.0015

53	10	7.24	0.34	9.8	Sea	10.80	89.0	17.99	0.92	1.36	5.86	5.85	1.25	4.71	0.01801	0.06747	27.46	0.0000
53	13	6.89	0.29	9.8	Sea	17.50	66.1	15.79	0.79	1.42	5.31	5.16	1.82	3.21	0.01420	0.07354	23.69	0.0006
53	16	6.59	0.29	3.7	Bay	12.40	34.4	6.66	0.02	0.93	1.45	1.30	0.70	0.12	0.00371	0.03119	0.00	-0.0032
53	19	7.01	0.25	8.5	Sea	12.70	42.8	13.00	0.02	1.25	1.88	1.75	0.80	0.27	0.00481	0.05704	0.00	-0.0009
53	22	7.35	0.33	9.8	Sea	19.70	26.0	17.10	0.80	1.71	5.88	5.53	2.07	3.36	0.01460	0.10627	23.83	0.0035
54	1	7.00	0.39	4.4	Bay	19.20	28.1	12.05	0.27	1.48	4.24	3.98	1.55	1.07	0.00816	0.08008	7.96	0.0012
54	4	6.68	0.37	4.1	Bay	20.40	64.1	10.73	0.02	1.30	1.99	1.80	1.12	0.11	0.00358	0.06156	0.00	-0.0005
54	7	7.13	0.60	4.1	Bay	16.70	48.4	16.02	0.32	1.64	5.29	5.15	1.46	1.53	0.00962	0.09769	9.52	0.0028
54	10	7.55	0.67	5.6	Bay	16.90	48.2	25.46	0.61	2.19	8.00	7.87	1.79	3.44	0.01481	0.17440	18.18	0.0097
54	13	7.24	0.77	5.6	Bay	16.30	39.5	30.58	0.50	2.52	8.55	8.41	1.75	3.63	0.01529	0.23146	13.96	0.0148
54	16	6.86	0.92	5.1	Bay	25.70	57.8	35.57	0.27	2.96	8.31	8.10	2.45	2.25	0.01167	0.31827	6.73	0.0226
54	19	7.32	1.15	5.1	Bay	22.50	28.1	41.49	0.21	3.39	8.63	8.38	2.18	2.43	0.01218	0.41683	4.00	0.0315
54	22	7.82	1.29	5.6	Bay	22.10	52.4	47.82	0.21	3.62	9.22	9.05	2.23	2.84	0.01325	0.47648	3.59	0.0369
55	1	7.72	1.72	6.7	Bay	11.30	9.2	74.51	0.24	4.93	12.45	12.37	1.46	6.84	0.02336	0.88468	1.44	0.0736
55	4	7.44	1.75	6.7	Bay	35.80	43.1	78.20	0.28	5.56	13.98	13.55	3.99	4.13	0.01655	1.12508	0.83	0.0952
55	7	7.72	1.93	6.7	Bay	34.00	1.1	83.74	0.33	5.98	15.32	14.79	4.00	5.01	0.01875	1.30123	0.62	0.1111
55	10	8.26	1.90	6.7	Bay	20.40	41.6	77.75	0.26	5.23	13.24	13.06	2.48	5.59	0.02021	0.99540	1.12	0.0836
55	13	8.06	1.74	11.6	Sea	25.10	60.1	88.32	0.30	5.45	13.32	13.11	3.28	7.06	0.02392	1.08050	1.79	0.0912
55	16	7.43	1.38	14.2	Sea	43.30	58.9	75.43	0.29	5.04	11.75	11.19	4.72	3.82	0.01576	0.92429	2.76	0.0772
55	19	7.49	1.38	4.7	Bay	27.40	24.5	43.88	0.18	3.69	8.92	8.58	2.55	2.03	0.01107	0.49480	2.55	0.0385
55	22	7.84	1.09	11.6	Sea	29.30	27.4	56.43	0.28	4.09	9.80	9.31	3.22	3.96	0.01612	0.60890	4.80	0.0488
56	1	7.80	1.10	14.2	Sea	37.90	58.4	58.23	0.32	4.08	9.90	9.41	4.03	3.49	0.01494	0.60572	6.13	0.0485
56	4	7.26	0.74	14.2	Sea	29.50	58.8	40.69	0.71	3.00	9.20	8.82	3.48	5.05	0.01886	0.32848	19.77	0.0235
56	7	7.34	0.85	11.6	Sea	10.70	25.5	45.67	0.60	3.07	9.64	9.53	1.50	8.71	0.02823	0.34266	16.34	0.0248
56	10	7.73	0.83	11.6	Sea	16.50	8.8	43.28	0.55	3.09	9.27	9.02	2.11	6.60	0.02275	0.34823	14.88	0.0253
56	13	7.63	0.67	14.2	Sea	28.30	63.4	35.87	1.05	2.69	9.32	8.98	3.50	5.93	0.02107	0.26316	30.34	0.0177
56	16	7.12	0.39	14.2	Sea	16.80	71.4	21.57	1.47	1.65	7.01	6.89	2.15	6.56	0.02264	0.09929	43.99	0.0029
56	19	7.18	0.31	9.8	Sea	1.40	27.0	16.08	0.02	1.22	1.92	1.92	0.13	1.75	0.01027	0.05459	0.00	-0.0011
56	22	7.61	0.31	11.6	Sea	22.30	63.5	16.31	0.93	1.55	5.58	5.32	2.34	3.31	0.01447	0.08723	27.94	0.0018
57	1	7.59	0.25	11.6	Sea	28.70	33.8	13.18	0.73	1.71	5.08	4.41	2.71	2.17	0.01144	0.10605	21.72	0.0035
57	4	7.15	0.18	11.6	Sea	8.10	74.3	9.79	0.02	0.84	1.31	1.27	0.52	0.30	0.00498	0.02577	0.00	-0.0037
57	7	7.06	0.17	11.6	Sea	3.80	67.2	9.36	0.02	0.77	1.23	1.22	0.28	0.64	0.00659	0.02180	0.00	-0.0041
57	10	7.34	0.18	11.6	Sea	15.80	55.8	9.48	0.02	1.04	1.51	1.32	0.90	0.13	0.00380	0.03945	0.00	-0.0025
57	13	7.41	0.20	11.6	Sea	7.90	60.6	10.54	0.02	0.92	1.41	1.36	0.52	0.36	0.00530	0.03063	0.00	-0.0033
57	16	6.93	0.19	11.6	Sea	15.80	85.8	10.41	0.02	0.95	1.43	1.35	0.88	0.11	0.00365	0.03307	0.00	-0.0031
57	19	6.92	0.15	9.8	Sea	24.10	45.2	8.28	0.02	1.26	1.76	1.33	1.26	0.07	0.00320	0.05805	0.00	-0.0008
57	22	7.35	0.19	9.8	Sea	6.10	13.4	9.79	0.02	0.90	1.39	1.33	0.42	0.44	0.00572	0.02963	0.00	-0.0034
58	1	7.51	0.19	11.6	Sea	15.50	86.4	9.99	0.02	0.92	1.38	1.31	0.86	0.11	0.00361	0.03089	0.00	-0.0032
58	4	7.09	0.14	11.6	Sea	17.40	16.0	7.76	0.02	1.08	1.53	1.20	0.96	0.11	0.00361	0.04258	0.00	-0.0022
58	7	6.91	0.13	11.6	Sea	22.90	20.8	7.04	0.02	1.21	1.67	1.18	1.20	0.07	0.00321	0.05305	0.00	-0.0013
58	10	7.20	0.15	4.7	Bay	10.80	59.0	4.97	0.02	0.69	1.08	0.97	0.59	0.09	0.00345	0.01719	0.00	-0.0045
58	13	7.28	0.17	11.6	Sea	6.80	73.1	9.09	0.02	0.78	1.23	1.20	0.45	0.34	0.00520	0.02228	0.00	-0.0040
58	16	6.95	0.14	11.6	Sea	12.00	21.6	7.63	0.02	0.90	1.32	1.12	0.70	0.16	0.00406	0.02966	0.00	-0.0034
58	19	6.83	0.11	11.6	Sea	20.00	30.5	6.08	0.02	1.04	1.44	1.04	1.04	0.07	0.00317	0.03944	0.00	-0.0025
58	22	7.15	0.12	8.5	Sea	7.70	4.0	5.99	0.02	0.70	1.08	0.97	0.46	0.19	0.00431	0.01796	0.00	-0.0044
59	1	7.49	0.15	9.8	Sea	21.10	60.6	7.68	0.02	1.08	1.52	1.22	1.09	0.07	0.00315	0.04229	0.00	-0.0022
59	4	7.28	0.20	11.6	Sea	26.60	68.3	10.60	0.02	1.33	1.86	1.50	1.38	0.07	0.00314	0.06430	0.00	-0.0002
59	7	7.01	0.26	11.6	Sea	10.90	5.3	14.41	0.02	1.30	1.92	1.78	0.74	0.41	0.00556	0.06168	0.00	-0.0005
59	10	7.23	0.35	5.1	Bay	5.80	25.8	12.84	0.02	1.19	1.92	1.88	0.41	0.51	0.00602	0.05140	0.00	-0.0014
59	13	7.50	0.46	4.1	Bay	14.60	32.7	11.19	0.02	1.30	2.01	1.84	0.87	0.18	0.00423	0.06145	0.00	-0.0005
59	16	7.32	0.63	4.7	Bay	13.50	50.9	20.64	0.45	1.85	6.59	6.50	1.33	2.56	0.01252	0.12394	13.43	0.0051
59	19	7.10	0.43	4.4	Bay	19.20	61.7	12.97	0.29	1.42	4.41	4.26	1.58	1.15	0.00843	0.07369	8.71	0.0006
59	22	7.27	0.34	6.1	Bay	11.50	9.0	14.38	0.45	1.41	4.83	4.71	1.10	2.31	0.01185	0.07199	13.42	0.0004

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8903

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day Jln	time hour	depth m	H cm	T sec	srce --	Uc cm/s	Phi deg	Ub cm/s	Zo cm	u*s cm/s	u*t cm/s	u*wm cm/s	u*c cm/s	Z'o cm	Cd --	Shlds ---	Kbr cm	C* cm
60	1	7.66	0.30	6.1	Sea	22.90	68.6	12.23	0.38	1.38	4.25	4.05	1.91	1.25	0.00876	0.06922	11.50	0.0002
60	4	7.55	0.26	7.5	Sea	26.90	89.9	12.18	0.02	1.28	1.87	1.71	1.38	0.06	0.00307	0.05982	0.00	-0.0006
60	7	7.22	0.22	8.5	Sea	13.50	74.3	11.24	0.02	1.05	1.61	1.53	0.80	0.18	0.00421	0.04032	0.00	-0.0024
60	10	7.12	0.17	7.5	Sea	10.30	23.9	8.08	0.02	0.92	1.39	1.26	0.62	0.20	0.00433	0.03057	0.00	-0.0033
60	13	7.38	0.18	7.5	Sea	9.10	30.5	8.78	0.02	0.92	1.42	1.32	0.57	0.24	0.00465	0.03110	0.00	-0.0032
60	16	7.31	0.16	8.5	Sea	10.50	24.4	8.20	0.02	0.92	1.38	1.24	0.63	0.20	0.00434	0.03070	0.00	-0.0033
60	19	7.05	0.15	11.6	Sea	15.10	7.4	8.17	0.02	1.04	1.49	1.22	0.86	0.14	0.00387	0.03950	0.00	-0.0025
60	22	7.04	0.12	8.5	Sea	27.50	33.6	6.30	0.02	1.30	1.79	1.19	1.38	0.05	0.00294	0.06180	0.00	-0.0005
61	1	7.44	0.15	7.5	Bay	18.30	9.3	7.08	0.02	1.10	1.58	1.23	0.99	0.09	0.00345	0.04419	0.00	-0.0021
61	4	7.55	0.21	11.6	Sea	7.70	7.6	11.33	0.02	1.03	1.54	1.45	0.53	0.44	0.00570	0.03823	0.00	-0.0026
61	7	7.18	0.23	11.6	Sea	11.70	65.9	12.69	0.02	1.10	1.66	1.58	0.74	0.27	0.00483	0.04435	0.00	-0.0020
61	10	7.02	0.21	11.6	Sea	14.20	2.7	11.81	0.02	1.24	1.80	1.57	0.88	0.23	0.00457	0.05590	0.00	-0.0010
61	13	7.23	0.20	11.6	Sea	9.20	25.8	10.59	0.02	1.01	1.51	1.39	0.60	0.33	0.00513	0.03682	0.00	-0.0027
61	16	7.32	0.20	11.6	Sea	13.20	63.5	10.51	0.02	1.01	1.51	1.39	0.79	0.18	0.00421	0.03721	0.00	-0.0027
61	19	7.07	0.17	11.6	Sea	19.00	56.6	9.03	0.02	1.10	1.57	1.30	1.03	0.09	0.00347	0.04389	0.00	-0.0021
61	22	6.86	0.16	11.6	Sea	13.80	10.3	9.13	0.02	1.06	1.53	1.30	0.82	0.17	0.00416	0.04090	0.00	-0.0023
62	1	7.22	0.25	9.8	Sea	13.70	13.3	13.04	0.02	1.31	1.93	1.73	0.87	0.27	0.00480	0.06274	0.00	-0.0004
62	4	7.51	0.23	5.1	Bay	29.20	63.5	8.15	0.22	1.37	3.23	2.80	2.05	0.50	0.00598	0.06808	6.45	0.0001
62	7	7.33	0.45	4.4	Bay	20.00	23.4	12.99	0.28	1.58	4.54	4.26	1.64	1.15	0.00842	0.09077	8.37	0.0021
62	10	6.97	0.28	3.9	Bay	12.60	61.6	6.76	0.02	0.87	1.38	1.28	0.70	0.11	0.00361	0.02738	0.00	-0.0036
62	13	7.09	0.34	6.1	Sea	5.60	63.9	14.95	0.02	1.27	2.04	2.02	0.41	0.64	0.00660	0.05853	0.00	-0.0008
62	16	7.40	0.40	6.7	Bay	8.50	74.7	18.02	0.61	1.46	5.83	5.81	0.91	3.60	0.01522	0.07793	18.28	0.0010
62	19	7.38	0.56	3.9	Bay	16.90	38.5	12.07	0.24	1.42	4.16	3.98	1.35	1.02	0.00800	0.07286	7.15	0.0005
62	22	7.08	0.70	4.4	Bay	13.60	19.8	21.27	0.42	1.97	6.78	6.66	1.33	2.48	0.01229	0.14104	12.54	0.0067
63	1	7.30	0.97	4.4	Bay	6.60	18.5	28.38	0.53	2.29	8.70	8.67	0.73	4.05	0.01635	0.19157	15.74	0.0112
63	4	7.73	0.85	9.8	Sea	24.80	35.8	42.59	0.39	3.25	8.87	8.52	2.73	3.96	0.01612	0.38533	9.62	0.0287
63	7	7.70	0.57	9.8	Sea	34.60	29.9	28.75	0.51	2.79	7.81	7.11	3.44	2.68	0.01282	0.28236	14.12	0.0194
63	10	7.25	0.63	8.5	Sea	16.50	76.1	31.58	1.13	2.31	9.70	9.64	2.10	6.49	0.02248	0.19474	33.77	0.0115
63	13	7.21	0.57	9.8	Sea	4.60	7.2	30.10	1.28	2.13	9.30	9.27	0.68	9.93	0.03150	0.16482	38.42	0.0088
63	16	7.61	0.66	9.8	Sea	9.10	42.8	33.57	1.21	2.39	9.92	9.86	1.30	9.17	0.02944	0.20747	35.64	0.0126
63	19	7.69	0.69	9.8	Sea	11.20	21.3	34.97	0.94	2.54	9.53	9.42	1.53	7.96	0.02625	0.23461	27.30	0.0151
63	22	7.25	0.49	11.6	Sea	16.90	77.9	26.32	1.38	1.92	8.30	8.23	2.19	6.89	0.02350	0.13475	41.34	0.0061
64	1	7.16	0.39	11.6	Sea	21.50	35.1	21.29	1.11	1.95	7.14	6.77	2.50	4.81	0.01825	0.13817	33.28	0.0064
64	4	7.65	0.48	11.6	Sea	15.70	20.4	24.93	1.28	2.04	8.05	7.81	2.03	6.80	0.02325	0.15103	38.28	0.0076
64	7	7.85	0.41	11.6	Sea	30.30	62.8	20.91	1.08	1.99	7.07	6.64	3.27	3.67	0.01538	0.14454	32.38	0.0070
64	10	7.30	0.30	11.6	Sea	25.40	72.3	16.06	0.92	1.55	5.49	5.24	2.58	2.92	0.01346	0.08693	27.54	0.0018
64	13	6.98	0.26	11.6	Sea	19.10	25.1	14.44	0.83	1.52	5.14	4.77	1.99	3.23	0.01427	0.08368	24.95	0.0015
64	16	7.34	0.28	11.6	Sea	5.80	2.5	14.78	0.02	1.19	1.82	1.76	0.44	0.80	0.00719	0.05194	0.00	-0.0014
64	19	7.60	0.29	11.6	Sea	20.30	53.0	15.11	0.88	1.49	5.25	4.97	2.12	3.23	0.01427	0.08086	26.29	0.0012
64	22	7.14	0.17	11.6	Sea	15.60	37.9	9.25	0.02	1.08	1.55	1.32	0.90	0.14	0.00390	0.04228	0.00	-0.0022
65	1	6.82	0.10	8.5	Sea	33.00	31.4	5.13	0.22	1.42	2.91	1.95	2.24	0.41	0.00558	0.07361	6.66	0.0006
65	4	7.33	0.16	11.6	Sea	25.00	87.6	8.63	0.02	1.07	1.49	1.25	1.22	0.04	0.00279	0.04135	0.00	-0.0023
65	7	7.78	0.25	9.8	Sea	10.00	54.8	12.61	0.02	1.12	1.71	1.63	0.66	0.34	0.00521	0.04562	0.00	-0.0019
65	10	7.41	0.40	4.1	Bay	16.70	18.7	10.02	0.02	1.30	1.97	1.73	0.96	0.14	0.00393	0.06134	0.00	-0.0005
65	13	6.91	0.28	3.9	Bay	30.50	53.5	6.74	0.14	1.40	2.91	2.37	1.96	0.29	0.00494	0.07122	4.01	0.0004
65	16	7.33	0.54	4.1	Bay	25.30	24.3	13.73	0.26	1.79	4.87	4.47	2.02	1.00	0.00792	0.11642	7.88	0.0044
65	19	7.93	0.66	4.7	Bay	23.70	68.5	19.50	0.42	1.88	6.31	6.16	2.14	1.80	0.01042	0.12864	12.59	0.0055
65	22	7.73	0.84	5.1	Bay	24.20	8.9	28.56	0.33	2.69	7.72	7.37	2.30	2.23	0.01163	0.26231	8.77	0.0176
66	1	7.16	1.07	5.1	Bay	26.00	88.6	39.56	0.30	2.96	8.90	8.88	2.54	2.49	0.01233	0.31813	7.50	0.0226
66	4	7.52	1.19	5.1	Bay	21.80	20.2	41.86	0.20	3.41	8.66	8.41	2.13	2.49	0.01234	0.42305	3.89	0.0320

66	7	8.20	1.27	6.1	Bay	22.20	67.4	48.82	0.23	3.56	9.31	9.19	2.29	3.09	0.01392	0.45987	4.39	0.0354
66	10	8.14	1.42	6.1	Bay	23.60	0.8	54.83	0.20	4.16	10.05	9.75	2.45	3.19	0.01417	0.63031	2.24	0.0507
66	13	7.53	1.48	5.6	Bay	39.50	56.1	56.65	0.20	4.43	10.64	10.24	3.71	2.12	0.01132	0.71458	1.54	0.0583
66	16	7.64	1.26	5.1	Bay	17.70	2.3	43.51	0.21	3.43	8.83	8.65	1.80	2.92	0.01347	0.42724	3.95	0.0324
66	19	8.36	1.20	5.6	Bay	31.50	36.9	41.48	0.20	3.54	8.58	8.18	2.89	1.92	0.01076	0.45511	3.49	0.0349
66	22	8.32	1.63	6.1	Bay	38.60	8.4	61.53	0.23	4.94	11.77	11.12	3.85	2.73	0.01296	0.88754	1.07	0.0738
67	1	7.63	1.45	5.6	Bay	31.60	83.7	54.87	0.20	3.91	9.95	9.87	3.05	2.37	0.01200	0.55626	2.80	0.0440
67	4	7.62	1.17	9.8	Sea	27.10	9.6	59.14	0.25	4.29	10.16	9.72	2.99	4.00	0.01621	0.66898	3.36	0.0542
67	7	8.29	1.46	6.1	Bay	21.20	76.9	55.55	0.21	3.87	9.95	9.88	2.24	3.43	0.01479	0.54598	3.25	0.0431
67	10	8.44	1.44	6.1	Bay	17.60	20.7	53.62	0.21	3.93	9.78	9.60	1.91	3.75	0.01560	0.56117	2.93	0.0445
67	13	7.73	1.56	6.1	Bay	38.30	58.4	62.98	0.22	4.69	11.40	11.04	3.78	2.59	0.01260	0.80155	1.41	0.0661
67	16	7.58	1.53	5.6	Bay	37.10	18.6	58.19	0.21	4.72	11.25	10.68	3.62	2.48	0.01230	0.81206	1.15	0.0671
67	19	8.26	1.43	9.8	Sea	21.20	77.5	68.66	0.26	4.35	10.89	10.81	2.55	5.40	0.01974	0.68939	3.62	0.0560
67	22	8.50	1.33	5.1	Bay	32.30	26.7	40.46	0.18	3.58	8.52	8.06	2.90	1.74	0.01024	0.46536	2.96	0.0359
68	1	7.85	1.28	5.1	Bay	31.50	68.9	42.63	0.21	3.39	8.75	8.55	2.89	1.91	0.01074	0.41769	4.09	0.0316
68	4	7.48	1.14	5.6	Bay	32.90	30.0	43.83	0.19	3.75	8.87	8.41	3.02	1.91	0.01072	0.51025	2.77	0.0399
68	7	8.09	1.29	5.1	Bay	19.40	61.1	41.66	0.24	3.20	8.80	8.69	1.95	2.83	0.01323	0.37261	5.32	0.0275
68	10	8.44	1.31	6.1	Bay	23.60	29.9	49.03	0.21	3.78	9.31	9.04	2.39	2.90	0.01340	0.51974	3.24	0.0407
68	13	7.83	1.28	5.1	Bay	21.80	63.8	42.99	0.22	3.30	8.86	8.74	2.15	2.62	0.01268	0.39647	4.70	0.0297
68	16	7.33	1.14	5.6	Bay	33.90	33.5	44.69	0.19	3.80	8.99	8.52	3.10	1.89	0.01066	0.52610	2.62	0.0413
68	19	7.90	1.04	11.6	Sea	15.70	76.3	53.61	0.44	3.43	9.90	9.84	2.06	7.08	0.02398	0.42817	10.99	0.0325
68	22	8.36	0.95	5.1	Bay	30.70	19.6	29.58	0.25	2.91	7.52	7.04	2.73	1.67	0.01003	0.30794	6.08	0.0217
69	1	7.86	0.92	5.6	Bay	24.80	36.9	33.87	0.29	2.92	8.12	7.83	2.40	2.39	0.01207	0.31113	7.38	0.0220
69	4	7.24	0.76	14.2	Sea	30.50	51.5	41.91	0.59	3.15	9.08	8.62	3.50	4.58	0.01767	0.36132	16.05	0.0265
69	7	7.67	0.81	11.6	Sea	22.40	30.4	42.49	0.50	3.16	9.05	8.70	2.65	5.11	0.01901	0.36324	13.14	0.0267
69	10	8.26	0.91	14.2	Sea	17.80	46.2	46.78	0.65	3.16	9.64	9.43	2.40	7.70	0.02557	0.36326	17.67	0.0267
69	13	7.84	0.81	14.2	Sea	25.00	55.9	43.02	0.70	3.06	9.40	9.09	3.10	5.93	0.02107	0.33974	19.21	0.0245
69	16	7.23	0.74	11.6	Sea	31.40	24.5	39.92	0.41	3.29	8.60	7.99	3.31	3.38	0.01465	0.39293	10.14	0.0293
69	19	7.67	0.78	9.8	Sea	17.20	57.4	39.32	0.66	2.81	9.36	9.22	2.14	6.06	0.02139	0.28785	18.41	0.0199
69	22	8.24	0.79	11.6	Sea	31.00	44.8	39.49	0.48	3.14	8.73	8.23	3.34	3.66	0.01537	0.35880	12.59	0.0263
70	1	7.99	0.72	14.2	Sea	35.40	66.8	37.74	0.78	2.90	9.02	8.59	3.98	4.27	0.01691	0.30549	21.99	0.0215
70	4	7.25	0.48	11.6	Sea	21.50	6.3	25.67	1.26	2.26	8.44	8.01	2.68	6.04	0.02134	0.18566	37.82	0.0107
70	7	7.36	0.42	9.8	Sea	22.50	56.1	21.90	0.97	1.94	7.19	6.92	2.51	4.14	0.01658	0.13648	29.03	0.0063
70	10	7.96	0.52	11.6	Sea	14.50	13.0	26.61	1.34	2.11	8.50	8.28	1.94	7.56	0.02520	0.16205	40.28	0.0086
70	13	7.74	0.44	11.6	Sea	17.40	88.8	22.90	1.27	1.67	7.29	7.27	2.14	5.77	0.02065	0.10126	38.08	0.0031
70	16	7.08	0.35	11.6	Sea	23.80	10.0	19.35	1.01	1.97	6.74	6.21	2.64	4.07	0.01640	0.14066	30.14	0.0066
70	19	7.25	0.31	9.8	Sea	27.30	80.6	16.36	0.79	1.55	5.48	5.30	2.65	2.42	0.01214	0.08790	23.68	0.0019
70	22	7.88	0.51	11.6	Sea	15.20	29.3	26.00	1.32	2.07	8.33	8.11	2.00	7.21	0.02431	0.15563	39.67	0.0080
71	1	7.83	0.36	11.6	Sea	30.40	73.4	18.77	1.01	1.79	6.34	6.02	3.14	3.12	0.01398	0.11679	30.34	0.0045
71	4	7.15	0.27	11.6	Sea	19.90	33.6	14.52	0.84	1.52	5.16	4.79	2.06	3.16	0.01407	0.08426	25.04	0.0016
71	7	6.99	0.30	11.6	Sea	25.30	32.7	16.36	0.88	1.79	5.87	5.34	2.62	3.14	0.01403	0.11614	26.47	0.0044
71	10	7.52	0.32	9.8	Sea	14.50	38.3	16.35	0.80	1.49	5.51	5.32	1.57	3.74	0.01556	0.08114	24.05	0.0013
71	13	7.63	0.31	11.6	Sea	5.00	71.5	16.39	0.02	1.23	1.90	1.89	0.40	0.98	0.00786	0.05515	0.00	-0.0011
71	16	7.21	0.36	11.6	Sea	23.80	32.8	19.42	1.02	1.92	6.69	6.23	2.64	4.05	0.01635	0.13350	30.56	0.0060
71	19	7.18	0.28	4.4	Bay	32.60	15.8	8.51	0.18	1.68	3.70	2.95	2.26	0.47	0.00583	0.10320	5.34	0.0033
71	22	7.72	0.42	4.4	Bay	17.60	79.8	11.28	0.02	1.18	1.87	1.79	0.99	0.12	0.00374	0.05103	0.00	-0.0014
72	1	7.92	0.28	4.7	Bay	29.80	51.7	8.25	0.20	1.46	3.36	2.84	2.08	0.48	0.00590	0.07742	5.89	0.0009
72	4	7.49	0.26	11.6	Sea	23.00	67.5	13.60	0.81	1.39	4.77	4.51	2.26	2.54	0.01246	0.07061	24.31	0.0003
72	7	7.17	0.27	9.8	Sea	15.70	12.0	13.99	0.70	1.43	4.89	4.62	1.61	3.00	0.01368	0.07441	20.95	0.0007
72	10	7.42	0.28	9.8	Sea	7.40	88.5	14.32	0.02	1.12	1.76	1.75	0.52	0.53	0.00611	0.04528	0.00	-0.0020
72	16	7.10	0.23	11.6	Sea	22.00	41.8	12.34	0.73	1.43	4.55	4.14	2.13	2.39	0.01205	0.07429	21.83	0.0007
72	19	6.82	0.24	11.6	Sea	16.50	17.1	13.18	0.79	1.38	4.70	4.39	1.71	3.16	0.01408	0.06927	23.65	0.0002
72	22	7.15	0.30	8.5	Sea	8.80	86.7	15.07	0.02	1.20	1.89	1.88	0.61	0.45	0.00576	0.05234	0.00	-0.0013
73	1	7.59	0.40	4.7	Bay	27.40	55.6	12.46	0.29	1.62	4.45	4.10	2.15	0.91	0.00761	0.09521	8.54	0.0025
73	4	7.41	0.37	3.9	Bay	21.80	27.8	7.88	0.02	1.29	1.90	1.53	1.16	0.08	0.00334	0.06067	0.00	-0.0006
73	7	7.00	0.38	4.1	Bay	17.40	83.2	10.36	0.02	1.11	1.77	1.70	0.96	0.11	0.00361	0.04484	0.00	-0.0020
73	10	7.02	0.27	3.9	Bay	24.50	62.6	6.27	0.02	1.15	1.65	1.30	1.22	0.05	0.00289	0.04798	0.00	-0.0017
73	13	7.39	0.31	5.6	Bay	9.80	15.9	12.18	0.02	1.22	1.91	1.80	0.64	0.32	0.00510	0.05457	0.00	-0.0011
73	16	7.26	0.32	7.5	Sea	10.70	89.9	15.31	0.02	1.24	1.96	1.96	0.71	0.35	0.00528	0.05576	0.00	-0.0010
73	19	6.89	0.24	8.5	Sea	24.80	8.0	12.74	0.52	1.65	4.79	4.24	2.24	1.78	0.01035	0.09893	15.59	0.0029

73	22	6.91	0.24	6.7	Sea	18.40	39.8	11.58	0.02	1.35	1.99	1.73	1.06	0.15	0.00397	0.06594	0.00	-0.0001
74	1	7.36	0.26	6.7	Sea	17.00	3.5	11.48	0.40	1.36	4.12	3.84	1.50	1.60	0.00984	0.06730	11.99	0.0000
74	4	7.38	0.25	7.5	Sea	16.40	62.6	11.77	0.02	1.21	1.82	1.67	0.96	0.16	0.00404	0.05314	0.00	-0.0012
74	7	6.96	0.22	7.5	Sea	20.90	40.5	10.78	0.02	1.35	1.96	1.64	1.17	0.12	0.00369	0.06660	0.00	-0.0000
74	10	6.72	0.17	9.8	Sea	21.40	18.7	9.30	0.02	1.31	1.85	1.44	1.18	0.10	0.00357	0.06235	0.00	-0.0004
74	13	7.00	0.24	7.5	Sea	11.00	76.7	11.92	0.02	1.06	1.67	1.63	0.69	0.25	0.00470	0.04125	0.00	-0.0023
74	16	7.14	0.23	6.1	Sea	5.20	2.9	9.97	0.02	0.95	1.53	1.49	0.36	0.45	0.00575	0.03304	0.00	-0.0031
74	19	6.86	0.19	8.5	Sea	10.00	11.1	10.06	0.02	1.04	1.57	1.44	0.63	0.27	0.00481	0.03919	0.00	-0.0025
74	22	6.64	0.15	5.6	Bay	23.00	47.7	6.51	0.02	1.15	1.64	1.25	1.17	0.06	0.00304	0.04852	0.00	-0.0017
75	1	6.99	0.19	5.6	Bay	20.00	81.4	7.82	0.02	0.99	1.47	1.32	1.03	0.06	0.00308	0.03551	0.00	-0.0028
75	4	7.42	0.22	6.1	Sea	11.70	4.3	9.22	0.02	1.07	1.62	1.46	0.71	0.20	0.00435	0.04145	0.00	-0.0023
75	7	7.15	0.24	3.7	Bay	13.60	88.9	4.72	0.02	0.65	1.04	0.99	0.69	0.06	0.00299	0.01553	0.00	-0.0046
75	10	6.88	0.24	3.5	Bay	32.60	36.3	4.13	0.07	1.37	2.38	1.58	1.86	0.13	0.00384	0.06877	2.20	0.0002
75	13	7.04	0.33	3.9	Bay	18.80	2.6	7.62	0.02	1.21	1.80	1.48	1.02	0.10	0.00349	0.05333	0.00	-0.0012
75	16	7.24	0.22	7.5	Sea	16.50	21.3	10.39	0.02	1.25	1.83	1.57	0.96	0.16	0.00404	0.05662	0.00	-0.0009
75	19	7.09	0.16	5.6	Bay	11.40	79.6	6.66	0.02	0.74	1.19	1.13	0.63	0.11	0.00362	0.02008	0.00	-0.0042
75	22	6.73	0.13	9.8	Sea	22.30	4.6	6.94	0.02	1.21	1.68	1.20	1.17	0.08	0.00325	0.05299	0.00	-0.0013
76	1	6.92	0.12	7.5	Sea	8.90	58.5	5.96	0.02	0.68	1.06	0.98	0.51	0.15	0.00394	0.01682	0.00	-0.0045
76	4	7.27	0.16	7.5	Sea	22.10	0.8	7.72	0.02	1.27	1.79	1.34	1.18	0.08	0.00336	0.05841	0.00	-0.0008
76	7	7.24	0.16	9.8	Sea	19.70	86.4	8.47	0.02	0.94	1.37	1.23	1.01	0.06	0.00306	0.03235	0.00	-0.0031
76	10	6.82	0.15	8.5	Sea	18.40	6.6	8.01	0.02	1.16	1.65	1.31	1.02	0.11	0.00359	0.04875	0.00	-0.0016
76	13	6.77	0.11	8.5	Sea	16.70	22.8	5.78	0.02	0.95	1.35	1.03	0.89	0.08	0.00332	0.03266	0.00	-0.0031
76	16	7.12	0.20	8.5	Sea	14.60	38.9	10.23	0.02	1.14	1.68	1.48	0.86	0.17	0.00414	0.04691	0.00	-0.0018
76	19	7.15	0.21	8.5	Sea	9.50	72.2	10.45	0.02	0.95	1.48	1.44	0.60	0.26	0.00476	0.03253	0.00	-0.0031
76	22	6.73	0.13	8.5	Sea	15.20	33.1	6.70	0.02	0.94	1.37	1.12	0.83	0.10	0.00353	0.03236	0.00	-0.0031
77	1	6.66	0.11	8.5	Sea	14.00	58.7	5.95	0.02	0.80	1.17	1.00	0.75	0.08	0.00335	0.02312	0.00	-0.0039
77	4	7.07	0.15	6.7	Sea	18.40	14.6	6.87	0.02	1.10	1.57	1.23	0.99	0.09	0.00341	0.04365	0.00	-0.0021
77	7	7.20	0.18	7.5	Sea	15.40	67.0	8.59	0.02	0.97	1.46	1.32	0.85	0.11	0.00362	0.03438	0.00	-0.0029
77	10	6.75	0.15	8.5	Sea	18.50	33.8	8.01	0.02	1.12	1.61	1.29	1.01	0.10	0.00351	0.04578	0.00	-0.0019
77	13	6.50	0.12	5.6	Bay	19.00	42.4	5.45	0.02	0.98	1.41	1.09	0.98	0.06	0.00309	0.03517	0.00	-0.0029
77	16	6.81	0.19	5.1	Bay	17.30	38.5	7.36	0.02	1.07	1.59	1.33	0.94	0.09	0.00347	0.04191	0.00	-0.0023
77	19	7.10	0.19	4.7	Bay	11.10	33.7	6.37	0.02	0.85	1.32	1.18	0.63	0.13	0.00381	0.02611	0.00	-0.0037
77	22	6.76	0.15	5.6	Bay	14.50	18.5	6.32	0.02	0.95	1.41	1.17	0.80	0.10	0.00355	0.03271	0.00	-0.0031
78	1	6.58	0.12	5.1	Bay	30.50	44.4	4.76	0.02	1.31	1.78	1.11	1.47	0.04	0.00270	0.06207	0.00	-0.0004
78	4	7.06	0.65	4.1	Bay	28.60	8.8	17.59	0.31	2.17	6.08	5.59	2.40	1.28	0.00884	0.17090	9.35	0.0094
78	7	7.40	0.64	5.1	Bay	4.60	29.1	22.95	0.54	1.86	7.21	7.19	0.51	4.03	0.01630	0.12549	16.08	0.0053
78	10	7.17	0.55	6.1	Bay	16.90	78.2	23.62	0.65	1.92	7.43	7.38	1.79	3.42	0.01474	0.13364	19.48	0.0060
78	13	6.74	0.45	4.7	Bay	26.20	86.3	16.03	0.37	1.57	5.22	5.15	2.20	1.28	0.00885	0.08970	11.12	0.0020
78	16	6.96	0.35	4.4	Bay	11.90	39.0	10.84	0.02	1.19	1.87	1.75	0.73	0.22	0.00446	0.05117	0.00	-0.0014
78	19	7.34	0.26	4.7	Bay	29.70	58.9	8.46	0.20	1.43	3.36	2.90	2.08	0.49	0.00594	0.07453	6.09	0.0007
78	22	7.10	0.24	4.4	Bay	35.40	64.2	7.43	0.16	1.53	3.19	2.59	2.30	0.32	0.00509	0.08468	4.85	0.0016
79	1	6.71	0.20	3.9	Bay	15.60	23.0	5.02	0.02	0.91	1.35	1.09	0.82	0.07	0.00325	0.03006	0.00	-0.0033
79	4	6.99	0.18	6.7	Sea	10.00	36.7	8.53	0.02	0.93	1.44	1.33	0.61	0.21	0.00441	0.03164	0.00	-0.0032
79	7	7.40	0.15	6.7	Sea	27.80	84.2	6.90	0.02	1.13	1.56	1.23	1.33	0.03	0.00264	0.04624	0.00	-0.0019
79	10	7.21	0.16	7.5	Sea	31.60	88.0	7.86	0.02	1.24	1.70	1.33	1.49	0.03	0.00258	0.05624	0.00	-0.0010
79	13	6.73	0.12	8.5	Sea	20.80	15.5	6.49	0.02	1.13	1.59	1.16	1.09	0.07	0.00324	0.04654	0.00	-0.0018
79	16	6.89	0.18	8.5	Sea	13.90	36.2	9.36	0.02	1.07	1.58	1.39	0.82	0.16	0.00409	0.04148	0.00	-0.0023
79	19	7.39	0.19	7.5	Sea	23.10	47.1	9.20	0.02	1.30	1.85	1.48	1.23	0.08	0.00334	0.06125	0.00	-0.0005
79	22	7.23	0.15	7.5	Sea	23.20	58.2	7.27	0.02	1.14	1.61	1.26	1.18	0.06	0.00304	0.04764	0.00	-0.0017
80	1	6.73	0.19	8.5	Sea	16.50	12.8	10.03	0.02	1.22	1.78	1.50	0.96	0.15	0.00401	0.05439	0.00	-0.0011
80	4	6.85	0.24	4.7	Bay	19.50	89.8	8.59	0.02	0.98	1.52	1.44	1.01	0.07	0.00315	0.03509	0.00	-0.0029
80	7	7.27	0.34	4.7	Bay	14.00	17.5	11.36	0.02	1.30	1.99	1.81	0.85	0.20	0.00437	0.06151	0.00	-0.0005
80	10	7.10	0.29	7.5	Sea	5.30	66.8	14.04	0.02	1.16	1.85	1.83	0.39	0.67	0.00672	0.04918	0.00	-0.0016
80	13	6.65	0.19	9.8	Sea	24.80	26.8	10.41	0.52	1.47	4.12	3.55	2.17	1.54	0.00964	0.07808	15.43	0.0010
80	16	6.81	0.18	3.3	Bay	41.70	28.2	2.57	0.04	1.60	2.38	1.13	2.13	0.06	0.00304	0.09308	1.22	0.0023
80	19	7.35	0.34	6.7	Sea	15.40	13.1	15.55	0.51	1.57	5.26	5.05	1.49	2.43	0.01217	0.08958	15.34	0.0020
80	22	7.36	0.30	7.5	Sea	15.20	55.8	14.26	0.56	1.37	4.82	4.69	1.47	2.42	0.01214	0.06779	16.62	0.0001
81	1	6.89	0.25	3.7	Bay	28.80	70.6	5.16	0.02	1.19	1.65	1.19	1.37	0.03	0.00263	0.05115	0.00	-0.0014
81	4	6.91	0.49	4.4	Bay	21.60	8.6	15.56	0.32	1.82	5.33	5.01	1.84	1.38	0.00916	0.12017	9.47	0.0048
81	7	7.39	0.40	4.1	Bay	18.90	62.5	10.01	0.02	1.23	1.88	1.70	1.04	0.11	0.00360	0.05472	0.00	-0.0011

81	10	7.46	0.36	5.1	Bay	20.00	66.8	12.59	0.33	1.37	4.30	4.15	1.67	1.23	0.00869	0.06809	9.97	0.0001
81	13	6.94	0.51	4.7	Bay	29.50	58.3	17.72	0.38	1.97	5.95	5.63	2.52	1.38	0.00917	0.14157	11.22	0.0067
81	16	6.83	0.43	4.4	Bay	18.90	38.7	13.70	0.30	1.56	4.69	4.47	1.58	1.26	0.00879	0.08817	8.87	0.0019
81	19	7.39	0.36	5.6	Bay	21.90	10.2	13.90	0.37	1.68	4.92	4.54	1.89	1.47	0.00943	0.10288	11.02	0.0032
81	22	7.54	0.35	4.1	Bay	29.30	69.1	8.42	0.18	1.37	3.21	2.87	2.00	0.42	0.00562	0.06805	5.38	0.0001
81	25	7.03	0.41	3.7	Bay	26.40	17.6	8.13	0.15	1.47	3.32	2.80	1.81	0.43	0.00568	0.07912	4.46	0.0011
82	4	6.87	0.36	3.7	Bay	20.50	64.9	7.57	0.02	1.11	1.67	1.45	1.07	0.07	0.00319	0.04472	0.00	-0.0020
82	7	7.37	0.43	3.7	Bay	20.20	3.1	7.83	0.02	1.27	1.89	1.54	1.09	0.09	0.00345	0.05899	0.00	-0.0007
82	10	7.61	0.49	5.6	Bay	22.00	73.4	18.63	0.49	1.73	6.05	5.93	2.05	2.05	0.01113	0.10871	14.61	0.0038
82	13	7.16	0.80	4.4	Bay	21.80	48.9	23.85	0.45	2.25	7.57	7.37	2.08	2.29	0.01177	0.18370	13.34	0.0105
82	16	7.00	0.78	5.1	Bay	19.10	68.1	29.50	0.54	2.41	8.70	8.61	2.00	3.30	0.01445	0.21201	15.42	0.0131
82	19	7.47	1.08	4.1	Bay	20.10	23.4	26.60	0.35	2.49	7.78	7.56	1.91	2.24	0.01165	0.22498	9.67	0.0142
82	22	7.85	1.30	5.1	Bay	31.60	88.1	43.30	0.24	3.23	8.96	8.91	2.94	2.05	0.01112	0.37879	5.30	0.0281
83	1	7.37	0.85	9.8	Sea	25.00	46.2	43.87	0.39	3.28	8.99	8.68	2.76	4.00	0.01623	0.39040	9.59	0.0291
83	4	6.96	0.69	9.8	Sea	25.10	20.3	36.80	0.47	3.00	8.55	8.12	2.75	3.92	0.01601	0.32707	12.52	0.0234
83	7	7.35	0.69	9.8	Sea	3.60	15.5	35.55	1.18	2.43	10.16	10.15	0.55	11.19	0.03506	0.21484	34.58	0.0133
83	10	7.65	0.80	9.8	Sea	22.20	53.2	40.24	0.52	2.98	9.06	8.83	2.57	4.75	0.01809	0.32252	14.18	0.0230
83	13	7.28	0.65	11.6	Sea	20.50	48.2	34.81	0.95	2.62	9.27	9.01	2.61	6.47	0.02243	0.24996	27.41	0.0165
83	16	6.91	0.42	8.5	Sea	27.30	21.2	21.74	0.79	2.24	7.39	6.85	2.86	3.27	0.01438	0.18177	23.57	0.0103
83	19	7.30	0.45	9.8	Sea	19.90	75.5	23.52	1.06	1.86	7.51	7.40	2.31	4.80	0.01824	0.12537	31.72	0.0053
83	22	7.71	0.51	9.8	Sea	5.80	24.5	25.71	1.15	1.88	8.08	8.04	0.80	8.17	0.02681	0.12920	34.46	0.0056
84	1	7.35	0.40	9.8	Sea	13.80	44.7	20.73	0.96	1.72	6.74	6.60	1.62	5.01	0.01876	0.10784	28.80	0.0037
84	4	6.90	0.21	9.8	Sea	27.40	27.9	11.58	0.55	1.61	4.55	3.91	2.43	1.64	0.00995	0.09443	16.52	0.0025
84	7	7.15	0.25	9.8	Sea	25.00	84.3	13.07	0.02	1.31	1.89	1.72	1.32	0.08	0.00329	0.06201	0.00	-0.0004
84	10	7.53	0.26	9.8	Sea	9.90	24.0	13.12	0.02	1.20	1.81	1.69	0.66	0.39	0.00544	0.05275	0.00	-0.0013
84	13	7.23	0.22	11.6	Sea	8.60	40.2	11.94	0.02	1.06	1.59	1.51	0.58	0.40	0.00552	0.04060	0.00	-0.0024
84	16	6.80	0.19	9.8	Sea	16.00	27.5	10.16	0.02	1.18	1.71	1.46	0.93	0.16	0.00405	0.05084	0.00	-0.0015
84	19	7.12	0.18	9.8	Sea	8.00	64.3	9.30	0.02	0.85	1.32	1.27	0.51	0.29	0.00492	0.02626	0.00	-0.0037
84	22	7.54	0.16	11.6	Sea	21.40	38.4	8.54	0.02	1.21	1.69	1.30	1.15	0.09	0.00339	0.05302	0.00	-0.0013
85	1	7.33	0.21	5.1	Bay	23.00	84.2	7.72	0.02	1.05	1.53	1.35	1.15	0.05	0.00290	0.03980	0.00	-0.0024
85	4	6.84	0.13	9.8	Sea	20.90	25.2	7.04	0.02	1.15	1.60	1.19	1.11	0.08	0.00328	0.04775	0.00	-0.0017
85	7	6.93	0.13	8.5	Sea	20.50	28.1	6.63	0.02	1.11	1.56	1.16	1.08	0.07	0.00324	0.04492	0.00	-0.0020
85	10	7.34	0.16	6.7	Sea	13.20	77.2	7.26	0.02	0.81	1.25	1.17	0.72	0.10	0.00354	0.02382	0.00	-0.0039
85	13	7.19	0.13	9.8	Sea	15.90	3.9	6.83	0.02	1.00	1.42	1.12	0.88	0.11	0.00358	0.03606	0.00	-0.0028
85	16	6.80	0.11	3.1	Bay	26.70	45.8	1.31	0.02	0.99	1.31	0.57	1.22	0.02	0.00240	0.03595	0.00	-0.0028
85	19	6.96	0.11	7.5	Sea	24.80	76.6	5.34	0.02	1.01	1.39	1.02	1.18	0.03	0.00264	0.03736	0.00	-0.0027
85	22	7.38	0.19	9.8	Sea	16.80	0.7	9.98	0.02	1.22	1.76	1.46	0.98	0.15	0.00400	0.05427	0.00	-0.0011
86	1	7.34	0.15	11.6	Sea	25.00	61.3	8.30	0.02	1.21	1.68	1.28	1.27	0.06	0.00304	0.05335	0.00	-0.0012
86	4	6.86	0.14	9.8	Sea	27.10	13.9	7.30	0.37	1.38	3.35	2.61	2.12	0.91	0.00760	0.06905	11.09	0.0002
86	7	6.83	0.15	8.5	Sea	12.10	40.3	7.68	0.02	0.90	1.35	1.19	0.70	0.15	0.00397	0.02967	0.00	-0.0034
86	10	7.20	0.19	9.8	Sea	5.30	18.6	10.02	0.02	0.90	1.40	1.35	0.37	0.52	0.00606	0.02926	0.00	-0.0034
86	13	7.17	0.17	8.5	Sea	5.40	67.1	8.46	0.02	0.77	1.23	1.21	0.36	0.38	0.00541	0.02131	0.00	-0.0041
86	16	6.75	0.12	8.5	Sea	19.40	7.9	6.27	0.02	1.08	1.52	1.12	1.03	0.08	0.00328	0.04229	0.00	-0.0022
86	19	6.77	0.16	8.5	Sea	17.80	52.1	8.46	0.02	1.07	1.56	1.31	0.97	0.10	0.00352	0.04196	0.00	-0.0023
86	22	7.19	0.17	9.8	Sea	18.60	13.1	8.67	0.02	1.19	1.69	1.34	1.04	0.11	0.00366	0.05150	0.00	-0.0014
87	1	7.27	0.17	9.8	Sea	19.20	71.4	8.82	0.02	1.03	1.50	1.30	1.02	0.08	0.00330	0.03894	0.00	-0.0025
87	4	6.87	0.13	9.8	Sea	15.40	11.7	7.24	0.02	1.00	1.44	1.16	0.86	0.12	0.00367	0.03653	0.00	-0.0027
87	7	6.70	0.11	8.5	Sea	17.00	59.5	6.03	0.02	0.88	1.27	1.03	0.88	0.07	0.00315	0.02835	0.00	-0.0035
87	10	6.97	0.14	8.5	Sea	16.50	51.7	7.02	0.02	0.95	1.38	1.15	0.89	0.09	0.00339	0.03301	0.00	-0.0031
87	13	7.10	0.13	9.8	Sea	6.60	7.4	6.72	0.02	0.71	1.09	1.01	0.42	0.26	0.00477	0.01841	0.00	-0.0044
87	16	6.75	0.15	9.8	Sea	5.80	26.6	8.24	0.02	0.79	1.22	1.17	0.39	0.38	0.00539	0.02243	0.00	-0.0040
87	19	6.60	0.14	8.5	Sea	17.00	52.6	7.37	0.02	0.99	1.43	1.19	0.92	0.09	0.00341	0.03530	0.00	-0.0029
87	22	6.91	0.16	9.8	Sea	13.10	66.5	8.82	0.02	0.91	1.37	1.26	0.75	0.14	0.00390	0.03027	0.00	-0.0033
88	1	7.13	0.25	4.1	Bay	12.90	31.1	6.67	0.02	0.93	1.44	1.27	0.72	0.12	0.00369	0.03174	0.00	-0.0032
88	4	6.80	0.15	14.2	Sea	7.50	32.4	8.82	0.02	0.83	1.24	1.15	0.49	0.33	0.00516	0.02482	0.00	-0.0038
88	7	6.48	0.12	8.5	Sea	22.70	78.4	6.27	0.02	0.98	1.36	1.08	1.11	0.04	0.00277	0.03464	0.00	-0.0029
88	10	6.65	0.14	5.1	Bay	13.30	74.5	5.59	0.02	0.74	1.14	1.04	0.70	0.08	0.00326	0.01972	0.00	-0.0043
88	13	6.91	0.20	4.7	Bay	9.30	30.9	7.03	0.02	0.85	1.35	1.25	0.55	0.17	0.00416	0.02644	0.00	-0.0036
88	16	6.70	0.16	9.8	Sea	3.10	40.4	8.99	0.02	0.78	1.24	1.22	0.23	0.68	0.00675	0.02186	0.00	-0.0041
88	19	6.48	0.14	5.6	Bay	17.20	46.2	6.30	0.02	0.97	1.43	1.17	0.91	0.08	0.00328	0.03449	0.00	-0.0029

88	22	6.68	0.17	5.6	Bay	15.80	76.1	7.42	0.02	0.90	1.37	1.26	0.84	0.08	0.00335	0.02916	0.00	-0.0034
89	1	7.10	0.19	8.5	Sea	19.00	31.8	9.58	0.02	1.24	1.78	1.47	1.06	0.12	0.00370	0.05579	0.00	-0.0010
89	4	6.95	0.19	9.8	Sea	14.30	85.9	9.97	0.02	0.92	1.40	1.35	0.81	0.13	0.00377	0.03074	0.00	-0.0033
89	7	6.56	0.12	8.5	Sea	5.00	67.5	6.55	0.02	0.63	1.02	1.00	0.32	0.30	0.00499	0.01421	0.00	-0.0048
89	10	6.64	0.14	9.8	Sea	7.60	58.8	7.77	0.02	0.75	1.17	1.12	0.47	0.25	0.00467	0.02061	0.00	-0.0042
89	13	6.98	0.15	7.5	Bay	20.60	38.5	7.25	0.02	1.14	1.62	1.26	1.09	0.08	0.00327	0.04693	0.00	-0.0018
89	16	6.98	0.15	9.8	Sea	17.30	66.0	7.97	0.02	0.97	1.40	1.20	0.93	0.09	0.00336	0.03390	0.00	-0.0030
89	19	6.78	0.17	9.8	Sea	1.10	41.4	9.31	0.02	0.77	1.25	1.25	0.09	1.14	0.00839	0.02171	0.00	-0.0041
89	22	6.82	0.17	3.0	Bay	16.20	61.8	1.51	0.02	0.63	0.87	0.55	0.75	0.03	0.00248	0.01452	0.00	-0.0047
90	1	7.16	0.26	6.7	Sea	25.00	22.7	11.73	0.38	1.60	4.42	3.92	2.10	1.28	0.00884	0.09262	11.50	0.0023
90	4	7.28	0.21	7.5	Sea	26.80	61.9	10.11	0.39	1.38	3.80	3.42	2.15	1.03	0.00804	0.06959	11.72	0.0002
90	7	6.99	0.20	6.1	Sea	17.30	88.1	9.04	0.02	0.95	1.47	1.40	0.92	0.08	0.00336	0.03299	0.00	-0.0031
90	10	6.85	0.20	6.7	Sea	13.10	6.2	9.75	0.02	1.13	1.70	1.51	0.79	0.19	0.00429	0.04660	0.00	-0.0018
90	13	7.13	0.28	7.5	Sea	10.90	54.6	13.42	0.02	1.23	1.89	1.81	0.71	0.32	0.00510	0.05476	0.00	-0.0011
90	16	7.23	0.45	8.5	Sea	2.80	42.6	22.57	0.92	1.68	7.16	7.15	0.37	6.97	0.02370	0.10222	27.45	0.0032
90	19	6.96	0.27	8.5	Sea	12.30	15.8	14.10	0.02	1.36	2.03	1.87	0.80	0.33	0.00514	0.06690	0.00	-0.0000
90	22	6.96	0.32	3.3	Bay	26.90	36.7	4.35	0.02	1.20	1.68	1.12	1.31	0.04	0.00276	0.05274	0.00	-0.0013

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8904

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
91	1	7.23	0.46	4.7	Bay	30.70	10.1	15.19	0.32	2.05	5.52	4.92	2.52	1.14	0.00839	0.15349	9.46	0.0078
91	4	7.44	0.37	8.5	Sea	9.10	70.0	18.19	0.78	1.44	5.92	5.88	1.03	4.45	0.01735	0.07586	23.49	0.0008
91	7	7.22	0.27	8.5	Sea	12.20	61.3	13.36	0.02	1.21	1.85	1.76	0.78	0.28	0.00485	0.05333	0.00	-0.0012
91	10	6.86	0.19	11.6	Sea	24.20	86.2	10.69	0.02	1.14	1.63	1.44	1.23	0.06	0.00304	0.04758	0.00	-0.0017
91	13	7.04	0.20	3.5	Bay	12.50	8.7	3.37	0.02	0.71	1.06	0.85	0.65	0.06	0.00312	0.01813	0.00	-0.0044
91	16	7.30	0.27	4.7	Bay	32.80	61.7	8.91	0.21	1.53	3.55	3.04	2.28	0.48	0.00589	0.08542	6.25	0.0017
91	19	7.14	0.29	4.4	Bay	8.80	30.8	8.66	0.02	0.97	1.56	1.47	0.54	0.23	0.00453	0.03413	0.00	-0.0030
91	22	6.69	0.15	9.8	Sea	18.50	87.2	8.29	0.02	0.90	1.32	1.20	0.95	0.06	0.00310	0.02954	0.00	-0.0034
92	1	6.94	0.17	3.7	Bay	24.10	11.6	3.50	0.02	1.09	1.51	0.96	1.17	0.04	0.00276	0.04284	0.00	-0.0022
92	4	7.36	0.25	4.7	Bay	19.00	80.6	7.98	0.02	0.99	1.51	1.38	0.99	0.07	0.00318	0.03580	0.00	-0.0028
92	7	7.28	0.21	4.4	Bay	20.10	6.6	6.27	0.02	1.14	1.66	1.28	1.06	0.08	0.00325	0.04757	0.00	-0.0017
92	10	6.75	0.17	4.4	Bay	24.40	80.7	5.35	0.02	1.00	1.41	1.12	1.17	0.03	0.00265	0.03651	0.00	-0.0027
92	13	6.75	0.11	4.7	Bay	19.30	8.9	3.92	0.02	0.95	1.34	0.93	0.97	0.05	0.00294	0.03268	0.00	-0.0031
92	16	7.24	0.14	8.5	Sea	27.30	16.2	7.10	0.31	1.38	3.26	2.54	2.07	0.76	0.00706	0.06904	9.34	0.0002
92	19	7.25	0.19	3.9	Bay	38.00	72.6	4.23	0.08	1.43	2.42	1.61	2.12	0.12	0.00368	0.07479	2.49	0.0007
92	22	6.73	0.16	4.1	Bay	25.90	39.4	4.67	0.02	1.17	1.64	1.11	1.27	0.04	0.00280	0.05018	0.00	-0.0015
93	1	6.65	0.14	7.5	Sea	15.70	38.9	6.94	0.02	0.97	1.41	1.17	0.86	0.10	0.00351	0.03416	0.00	-0.0030
93	4	7.20	0.15	7.5	Sea	16.00	27.1	7.44	0.02	1.03	1.50	1.24	0.89	0.11	0.00362	0.03887	0.00	-0.0025
93	7	7.37	0.23	5.1	Bay	23.20	31.9	8.21	0.02	1.32	1.90	1.50	1.23	0.08	0.00331	0.06355	0.00	-0.0003
93	10	6.78	0.13	6.1	Sea	21.90	0.9	5.66	0.02	1.14	1.60	1.14	1.13	0.06	0.00310	0.04729	0.00	-0.0018
93	13	6.55	0.10	4.1	Bay	29.70	33.3	2.96	0.02	1.21	1.63	0.88	1.40	0.03	0.00257	0.05287	0.00	-0.0013
93	16	7.08	0.18	4.7	Bay	23.80	28.4	6.02	0.02	1.21	1.72	1.25	1.21	0.06	0.00304	0.05344	0.00	-0.0012
93	19	7.40	0.24	5.6	Bay	18.60	55.0	9.47	0.02	1.18	1.77	1.55	1.03	0.11	0.00359	0.05102	0.00	-0.0014
93	22	6.88	0.24	6.7	Sea	29.70	16.9	11.19	0.36	1.72	4.45	3.77	2.40	1.06	0.00814	0.10775	10.64	0.0037
94	1	6.51	0.10	8.5	Sea	35.60	3.5	5.55	0.23	1.57	3.23	2.11	2.45	0.45	0.00575	0.08955	6.94	0.0020
94	4	7.01	0.31	6.1	Sea	24.30	60.1	13.82	0.41	1.56	4.79	4.52	2.09	1.43	0.00931	0.08850	12.37	0.0019
94	7	7.40	0.37	5.1	Bay	24.80	61.4	13.28	0.33	1.55	4.60	4.35	2.03	1.14	0.00839	0.08792	9.99	0.0019
94	10	6.91	0.33	5.1	Bay	30.70	14.7	12.55	0.29	1.87	4.80	4.16	2.42	0.95	0.00774	0.12721	8.77	0.0054
94	13	6.37	0.15	3.5	Bay	29.90	41.5	3.06	0.02	1.21	1.64	0.93	1.41	0.03	0.00256	0.05316	0.00	-0.0012
94	16	6.85	0.25	6.1	Sea	26.00	52.7	11.17	0.34	1.49	4.12	3.73	2.09	1.03	0.00802	0.08082	10.19	0.0012
94	19	7.39	0.38	8.5	Sea	28.00	46.0	18.72	0.71	1.98	6.44	5.98	2.77	2.62	0.01268	0.14222	21.31	0.0068
94	22	7.07	0.32	6.7	Sea	30.90	42.6	14.81	0.45	1.89	5.38	4.83	2.67	1.46	0.00942	0.12930	13.58	0.0056
95	1	6.39	0.11	9.8	Sea	38.10	6.8	6.20	0.29	1.68	3.59	2.34	2.73	0.56	0.00626	0.10313	8.70	0.0033
95	4	6.67	0.16	7.5	Sea	33.50	68.6	8.10	0.31	1.44	3.39	2.81	2.43	0.60	0.00643	0.07567	9.24	0.0008
95	7	7.32	0.41	4.7	Bay	20.70	4.8	13.43	0.31	1.64	4.72	4.39	1.73	1.26	0.00878	0.09800	9.15	0.0028
95	10	7.12	0.26	7.5	Sea	15.00	43.0	12.56	0.02	1.30	1.94	1.76	0.91	0.21	0.00442	0.06108	0.00	-0.0005
95	13	6.41	0.12	6.7	Sea	38.90	29.0	6.05	0.19	1.69	3.38	2.26	2.59	0.37	0.00534	0.10342	5.80	0.0033
95	16	6.62	0.17	5.1	Bay	30.10	63.7	6.94	0.02	1.33	1.85	1.36	1.47	0.04	0.00279	0.06449	0.00	-0.0002
95	19	7.42	0.29	6.1	Sea	31.50	18.0	12.33	0.34	1.86	4.81	4.11	2.54	1.06	0.00813	0.12526	10.30	0.0052
95	22	7.36	0.30	7.5	Sea	26.10	84.0	14.12	0.54	1.42	4.74	4.62	2.30	1.62	0.00988	0.07290	16.22	0.0005
96	1	6.70	0.45	3.9	Bay	46.10	59.8	11.40	0.19	2.10	4.60	3.80	3.14	0.42	0.00563	0.15987	5.77	0.0084
96	4	6.56	0.32	4.4	Bay	28.90	27.2	10.83	0.23	1.69	4.17	3.63	2.16	0.70	0.00684	0.10416	6.78	0.0033
96	7	7.36	0.56	4.4	Bay	27.90	79.7	16.06	0.34	1.68	5.28	5.15	2.29	1.16	0.00845	0.10218	10.10	0.0032
96	10	7.32	0.33	9.8	Sea	23.80	79.1	17.30	0.84	1.55	5.73	5.59	2.41	2.91	0.01343	0.08694	25.10	0.0018
96	13	6.66	0.23	9.8	Sea	23.50	2.9	12.93	0.62	1.61	4.85	4.31	2.21	2.14	0.01137	0.09407	18.47	0.0024
96	16	6.52	0.12	8.5	Sea	29.90	62.1	6.30	0.02	1.28	1.74	1.18	1.45	0.04	0.00273	0.05942	0.00	-0.0007
96	19	7.30	0.24	8.5	Sea	29.70	29.6	12.06	0.49	1.72	4.72	4.05	2.55	1.43	0.00933	0.10747	14.53	0.0036
96	22	7.52	0.17	9.8	Sea	35.10	37.4	8.58	0.41	1.66	3.98	3.03	2.74	0.89	0.00753	0.09985	12.11	0.0030
97	1	6.74	0.15	11.6	Sea	33.90	42.3	8.66	0.49	1.59	3.97	3.06	2.74	1.06	0.00813	0.09239	14.67	0.0023
97	4	6.38	0.06	9.8	Sea	39.50	46.5	3.11	0.15	1.50	2.66	1.33	2.40	0.21	0.00441	0.08189	4.56	0.0013

97	7	7.06	0.21	8.5	Sea	21.80	30.6	10.54	0.46	1.38	3.99	3.57	1.89	1.50	0.00954	0.06962	13.84	0.0002
97	10	7.36	0.19	9.8	Sea	24.50	50.1	9.73	0.02	1.34	1.88	1.48	1.30	0.08	0.00331	0.06491	0.00	-0.0002
97	13	6.79	0.18	8.5	Sea	27.40	1.4	9.24	0.39	1.52	3.90	3.20	2.22	1.09	0.00822	0.08432	11.68	0.0016
97	16	6.57	0.54	3.9	Bay	33.10	42.7	14.17	0.25	1.98	5.12	4.60	2.53	0.80	0.00721	0.14298	7.33	0.0068
97	19	7.55	0.97	4.1	Bay	36.10	75.5	23.42	0.42	2.33	7.51	7.29	3.15	1.54	0.00965	0.19745	11.80	0.0117
97	22	7.72	1.16	6.7	Bay	17.20	59.0	50.32	0.25	3.57	9.43	9.32	1.90	4.00	0.01623	0.46457	4.87	0.0358
98	1	7.05	0.57	5.6	Bay	29.80	32.6	23.47	0.44	2.45	7.35	6.89	2.78	2.05	0.01114	0.21814	12.43	0.0136
98	4	6.52	0.32	4.4	Bay	33.40	39.7	10.81	0.22	1.78	4.25	3.63	2.43	0.62	0.00649	0.11573	6.63	0.0044
98	7	6.90	0.26	8.5	Sea	18.50	30.0	13.66	0.58	1.48	4.81	4.51	1.78	2.32	0.01188	0.07945	17.47	0.0011
98	10	7.43	0.22	7.5	Bay	35.10	87.2	10.53	0.40	1.45	3.81	3.51	2.67	0.78	0.00713	0.07609	11.99	0.0008
98	13	7.02	0.19	9.8	Sea	23.70	56.6	10.34	0.02	1.31	1.86	1.52	1.27	0.09	0.00336	0.06289	0.00	-0.0004
98	16	6.48	0.16	9.8	Sea	31.80	20.6	9.01	0.43	1.62	4.04	3.16	2.57	1.05	0.00811	0.09557	12.82	0.0026
98	19	6.87	0.21	9.8	Sea	15.60	33.3	11.39	0.02	1.23	1.80	1.58	0.93	0.19	0.00425	0.05540	0.00	-0.0010
98	22	7.54	0.17	8.5	Sea	38.70	56.1	8.38	0.34	1.69	3.85	2.95	2.85	0.65	0.00665	0.10331	10.17	0.0033
99	1	7.28	0.13	9.8	Sea	34.40	85.9	6.83	0.02	1.30	1.74	1.20	1.59	0.03	0.00248	0.06176	0.00	-0.0005
99	4	6.54	0.09	9.8	Sea	42.10	4.6	4.78	0.22	1.74	3.39	1.91	2.81	0.37	0.00536	0.10969	6.63	0.0038
99	7	6.63	0.08	2.8	Bay	30.00	44.4	0.55	0.02	1.07	1.38	0.39	1.34	0.02	0.00231	0.04141	0.00	-0.0023
99	10	7.26	0.14	6.1	Bay	20.40	42.0	5.98	0.02	1.06	1.50	1.15	1.05	0.06	0.00310	0.04050	0.00	-0.0024
99	13	7.16	0.17	9.8	Sea	4.50	14.3	8.74	0.02	0.79	1.25	1.21	0.32	0.51	0.00602	0.02297	0.00	-0.0040
99	16	6.62	0.07	9.8	Sea	30.00	37.9	3.76	0.02	1.23	1.64	0.87	1.43	0.03	0.00262	0.05497	0.00	-0.0011
99	19	6.78	0.09	8.5	Sea	29.80	70.3	4.46	0.02	1.16	1.55	0.95	1.39	0.03	0.00253	0.04920	0.00	-0.0016
99	22	7.41	0.25	8.5	Sea	23.30	2.8	12.49	0.52	1.59	4.67	4.17	2.11	1.81	0.01045	0.09199	15.52	0.0023
100	1	7.39	0.16	9.8	Sea	23.30	86.9	8.26	0.02	1.02	1.44	1.24	1.15	0.05	0.00284	0.03784	0.00	-0.0026
100	4	6.76	0.14	9.8	Sea	30.80	12.4	7.36	0.36	1.50	3.55	2.65	2.37	0.83	0.00733	0.08235	10.80	0.0014
100	7	6.62	0.09	5.1	Bay	31.30	25.2	3.57	0.02	1.30	1.76	0.96	1.49	0.03	0.00263	0.06173	0.00	-0.0005
100	10	7.12	0.17	8.5	Sea	20.70	32.0	8.70	0.02	1.24	1.76	1.39	1.13	0.10	0.00348	0.05550	0.00	-0.0010
100	13	7.22	0.18	8.5	Sea	10.40	74.9	9.08	0.02	0.86	1.35	1.29	0.62	0.19	0.00429	0.02698	0.00	-0.0036
100	16	6.75	0.17	9.8	Sea	21.10	1.0	9.22	0.02	1.31	1.85	1.43	1.17	0.11	0.00360	0.06235	0.00	-0.0004
100	19	6.72	0.14	3.1	Bay	38.50	72.1	1.61	0.03	1.37	1.87	0.77	1.81	0.03	0.00257	0.06843	0.78	0.0001
100	22	7.30	0.50	5.1	Bay	20.10	62.6	18.18	0.44	1.75	5.94	5.79	1.85	1.96	0.01087	0.11112	13.05	0.0040
101	1	7.55	0.43	5.1	Bay	23.60	18.1	15.19	0.36	1.82	5.30	4.91	2.03	1.45	0.00938	0.11993	10.74	0.0048
101	4	7.15	0.52	4.7	Bay	24.60	35.5	17.34	0.37	1.95	5.87	5.53	2.15	1.55	0.00967	0.13764	11.05	0.0064
101	7	6.86	0.42	4.4	Bay	16.40	72.8	13.27	0.02	1.33	2.11	2.02	0.97	0.17	0.00416	0.06468	0.00	-0.0002
101	10	7.12	0.36	4.1	Bay	8.00	68.9	9.64	0.02	0.97	1.62	1.59	0.50	0.26	0.00473	0.03449	0.00	-0.0029
101	13	7.40	0.30	5.6	Bay	24.00	79.8	11.85	0.02	1.32	1.97	1.80	1.28	0.08	0.00334	0.06302	0.00	-0.0004
101	16	7.03	0.26	6.7	Bay	19.20	11.1	12.27	0.42	1.47	4.41	4.07	1.70	1.62	0.00988	0.07881	12.42	0.0011
101	19	6.74	0.18	6.7	Sea	27.40	21.4	8.76	0.30	1.49	3.66	3.04	2.10	0.81	0.00725	0.08079	8.83	0.0012
101	22	7.02	0.27	8.5	Sea	9.70	62.3	13.61	0.02	1.18	1.82	1.76	0.65	0.37	0.00538	0.05064	0.00	-0.0015
102	1	7.43	0.27	9.8	Sea	25.00	47.2	13.64	0.66	1.58	4.95	4.51	2.35	2.13	0.01135	0.09102	19.61	0.0022
102	4	7.22	0.23	9.8	Sea	20.00	59.3	12.15	0.02	1.30	1.89	1.66	1.13	0.13	0.00379	0.06176	0.00	-0.0005
102	7	6.84	0.20	9.8	Sea	17.30	4.9	10.99	0.02	1.30	1.87	1.57	1.02	0.17	0.00410	0.06134	0.00	-0.0005
102	10	6.97	0.21	9.8	Sea	26.10	58.5	11.40	0.57	1.43	4.25	3.83	2.30	1.59	0.00980	0.07434	17.07	0.0007
102	13	7.35	0.28	9.8	Sea	11.70	13.3	14.61	0.02	1.35	2.01	1.86	0.78	0.37	0.00537	0.06674	0.00	-0.0000
102	16	7.18	0.27	9.8	Sea	11.90	73.6	14.35	0.02	1.20	1.84	1.78	0.77	0.31	0.00501	0.05274	0.00	-0.0013
102	19	6.81	0.24	6.1	Sea	15.10	6.8	10.64	0.02	1.26	1.88	1.65	0.90	0.18	0.00421	0.05772	0.00	-0.0008
102	22	6.88	0.29	6.7	Sea	11.20	47.9	13.75	0.02	1.29	1.99	1.89	0.73	0.32	0.00510	0.06029	0.00	-0.0006
103	1	7.34	0.37	8.5	Sea	25.20	24.7	18.65	0.71	1.98	6.45	5.97	2.54	2.84	0.01325	0.14316	21.21	0.0069
103	4	7.32	0.38	8.5	Sea	30.50	82.6	18.89	0.75	1.75	6.19	6.02	2.94	2.38	0.01202	0.11174	22.57	0.0040
103	7	6.96	0.30	6.7	Sea	15.10	15.7	14.33	0.48	1.48	4.90	4.69	1.44	2.23	0.01163	0.07978	14.48	0.0012
103	10	6.85	0.31	7.5	Sea	14.70	36.3	15.40	0.58	1.49	5.19	5.02	1.47	2.71	0.01292	0.08025	17.36	0.0012
103	13	7.21	0.48	8.5	Sea	6.90	11.2	24.32	0.95	1.86	7.68	7.63	0.88	6.50	0.02250	0.12618	28.37	0.0053
103	16	7.27	0.41	8.5	Sea	13.30	65.5	20.48	0.84	1.66	6.60	6.53	1.51	4.39	0.01721	0.09978	25.03	0.0030
103	19	6.97	0.34	11.6	Sea	12.10	48.5	18.65	1.07	1.52	6.14	6.02	1.46	5.47	0.01992	0.08428	32.17	0.0016
103	22	6.86	0.25	8.5	Sea	21.10	37.9	13.08	0.56	1.49	4.69	4.34	1.96	2.02	0.01103	0.08113	16.67	0.0013
104	1	7.26	0.29	8.5	Sea	14.20	51.6	14.62	0.65	1.36	4.94	4.80	1.44	2.90	0.01340	0.06751	19.32	0.0000
104	4	7.45	0.32	9.8	Sea	11.30	58.5	16.34	0.83	1.37	5.42	5.34	1.26	4.17	0.01665	0.06795	24.91	0.0001
104	7	7.14	0.26	9.8	Sea	18.50	27.7	13.71	0.68	1.47	4.86	4.54	1.84	2.66	0.01278	0.07857	20.30	0.0010
104	10	6.91	0.30	11.6	Sea	16.00	17.0	16.47	0.94	1.56	5.65	5.37	1.79	4.19	0.01670	0.08853	28.13	0.0019
104	13	7.12	0.28	11.6	Sea	14.20	79.5	15.26	0.02	1.24	1.87	1.81	0.89	0.25	0.00471	0.05610	0.00	-0.0010
104	16	7.36	0.31	5.6	Bay	14.10	44.0	12.19	0.02	1.29	1.97	1.83	0.86	0.21	0.00443	0.06024	0.00	-0.0006

104	19	7.14	0.27	9.8	Sea	23.20	67.5	14.08	0.70	1.44	4.88	4.64	2.22	2.29	0.01178	0.07569	21.01	0.0008
104	22	6.80	0.20	9.8	Sea	15.00	3.1	11.14	0.02	1.24	1.80	1.56	0.91	0.20	0.00435	0.05583	0.00	-0.0010
105	1	7.03	0.19	9.8	Sea	5.60	19.6	10.33	0.02	0.92	1.43	1.38	0.39	0.51	0.00602	0.03103	0.00	-0.0032
105	4	7.34	0.20	9.8	Sea	13.20	50.0	10.63	0.02	1.08	1.61	1.46	0.80	0.20	0.00432	0.04243	0.00	-0.0022
105	7	7.22	0.23	11.6	Sea	15.10	57.9	12.70	0.02	1.20	1.77	1.62	0.91	0.20	0.00437	0.05280	0.00	-0.0013
105	10	6.86	0.16	9.8	Sea	15.90	5.7	8.49	0.02	1.10	1.58	1.30	0.91	0.13	0.00384	0.04399	0.00	-0.0021
105	13	6.99	0.22	8.5	Sea	8.50	29.5	11.38	0.02	1.07	1.64	1.55	0.57	0.37	0.00535	0.04167	0.00	-0.0023
105	16	7.31	0.39	7.5	Sea	5.90	67.8	18.72	0.71	1.47	6.05	6.03	0.68	4.58	0.01769	0.07912	21.16	0.0011
105	19	7.30	0.65	8.5	Sea	19.00	84.5	32.34	1.14	2.33	9.86	9.83	2.39	6.22	0.02180	0.19795	33.43	0.0118
105	22	6.93	0.44	9.8	Sea	21.60	7.1	23.42	0.99	2.16	7.76	7.35	2.49	4.67	0.01791	0.17032	29.70	0.0093
106	1	6.99	0.45	11.6	Sea	26.10	59.1	24.95	1.25	2.14	8.14	7.80	3.09	5.11	0.01901	0.16638	37.57	0.0089
106	4	7.39	0.53	11.6	Sea	11.00	17.1	28.32	1.43	2.12	8.90	8.77	1.56	8.94	0.02883	0.16282	42.83	0.0086
106	7	7.43	0.53	11.6	Sea	18.00	82.6	28.29	1.45	2.02	8.83	8.78	2.38	7.25	0.02441	0.14842	43.58	0.0073
106	10	7.02	0.37	11.6	Sea	19.30	70.3	20.11	1.12	1.65	6.59	6.44	2.23	4.69	0.01796	0.09959	33.55	0.0029
106	13	6.96	0.31	11.6	Sea	16.00	32.8	17.34	0.98	1.58	5.87	5.63	1.82	4.43	0.01731	0.09090	29.46	0.0022
106	16	7.41	0.30	9.8	Sea	13.10	35.4	15.73	0.79	1.43	5.30	5.14	1.42	3.75	0.01560	0.07415	23.55	0.0006
106	19	7.52	0.24	9.8	Sea	25.30	61.5	12.26	0.61	1.44	4.45	4.09	2.29	1.79	0.01039	0.07498	18.33	0.0007
106	22	7.11	0.21	9.8	Sea	17.60	50.7	11.10	0.02	1.22	1.77	1.55	1.01	0.14	0.00392	0.05396	0.00	-0.0012
107	1	6.96	0.19	9.8	Sea	17.30	33.0	10.18	0.02	1.21	1.75	1.47	0.99	0.14	0.00391	0.05319	0.00	-0.0012
107	4	7.35	0.26	9.8	Sea	6.50	16.0	13.21	0.02	1.13	1.74	1.68	0.47	0.60	0.00640	0.04669	0.00	-0.0018
107	7	7.50	0.26	7.5	Sea	7.30	36.7	12.15	0.02	1.10	1.72	1.66	0.50	0.44	0.00573	0.04421	0.00	-0.0021
107	10	7.08	0.18	9.8	Sea	14.20	46.3	9.65	0.02	1.06	1.56	1.37	0.83	0.16	0.00406	0.04053	0.00	-0.0024
107	13	6.83	0.14	9.8	Sea	30.80	38.3	7.53	0.37	1.46	3.48	2.69	2.37	0.82	0.00730	0.07730	11.19	0.0009
107	16	7.17	0.28	9.8	Sea	20.60	78.0	14.99	0.76	1.37	5.04	4.92	2.05	2.68	0.01283	0.06783	22.86	0.0001
107	19	7.41	0.34	11.6	Sea	2.20	65.5	18.11	0.02	1.32	2.04	2.04	0.20	1.83	0.01051	0.06353	0.00	-0.0003
107	22	6.98	0.20	11.6	Sea	15.00	27.7	10.75	0.02	1.17	1.70	1.47	0.90	0.19	0.00425	0.05008	0.00	-0.0015
108	1	6.64	0.15	9.8	Sea	27.20	36.2	8.27	0.42	1.39	3.55	2.90	2.19	1.04	0.00806	0.07030	12.52	0.0003
108	4	6.97	0.18	9.8	Sea	17.30	72.4	9.47	0.02	1.02	1.50	1.34	0.95	0.10	0.00352	0.03780	0.00	-0.0026
108	7	7.31	0.19	9.8	Sea	13.20	62.4	9.88	0.02	0.99	1.49	1.37	0.78	0.17	0.00411	0.03591	0.00	-0.0028
108	10	7.07	0.16	11.6	Sea	6.80	55.3	8.75	0.02	0.79	1.22	1.17	0.45	0.34	0.00520	0.02285	0.00	-0.0040
108	13	6.69	0.15	9.8	Sea	18.00	29.8	8.01	0.02	1.11	1.58	1.26	0.99	0.10	0.00356	0.04446	0.00	-0.0020
108	16	7.03	0.16	9.8	Sea	9.00	76.3	8.68	0.02	0.80	1.24	1.20	0.55	0.22	0.00447	0.02299	0.00	-0.0040
108	19	7.44	0.22	9.8	Sea	18.40	62.8	11.52	0.02	1.21	1.77	1.57	1.04	0.13	0.00381	0.05325	0.00	-0.0012
108	22	7.21	0.17	11.6	Sea	21.00	51.6	9.09	0.02	1.18	1.66	1.34	1.13	0.09	0.00339	0.05059	0.00	-0.0015
109	1	6.70	0.14	11.6	Sea	19.40	21.9	7.73	0.02	1.14	1.59	1.21	1.05	0.09	0.00346	0.04689	0.00	-0.0018
109	4	6.91	0.20	9.8	Sea	18.80	59.2	10.49	0.02	1.18	1.71	1.48	1.05	0.11	0.00367	0.05047	0.00	-0.0015
109	7	7.38	0.22	11.6	Sea	4.30	17.2	11.96	0.02	0.98	1.52	1.48	0.33	0.79	0.00718	0.03504	0.00	-0.0029
109	10	7.31	0.33	3.9	Bay	10.60	84.3	7.14	0.02	0.79	1.32	1.29	0.60	0.13	0.00379	0.02246	0.00	-0.0040
109	13	6.94	0.46	4.1	Bay	37.70	50.4	12.66	0.23	1.97	4.79	4.16	2.76	0.64	0.00659	0.14155	6.98	0.0067
109	16	7.14	0.42	4.1	Bay	16.00	22.0	11.13	0.02	1.35	2.07	1.86	0.94	0.17	0.00412	0.06650	0.00	-0.0000
109	19	7.61	0.31	5.1	Bay	25.80	38.1	10.62	0.27	1.53	4.00	3.56	1.99	0.84	0.00737	0.08559	8.04	0.0017
109	22	7.46	0.27	14.2	Sea	35.40	68.8	14.43	0.96	1.74	5.38	4.77	3.38	2.28	0.01175	0.10969	28.85	0.0038
110	1	6.87	0.18	9.8	Sea	28.40	1.6	9.88	0.47	1.58	4.17	3.41	2.40	1.32	0.00897	0.09113	14.20	0.0022
110	4	6.92	0.16	9.8	Sea	14.30	31.8	8.55	0.02	1.02	1.49	1.28	0.82	0.14	0.00393	0.03821	0.00	-0.0026
110	7	7.40	0.19	11.6	Sea	16.60	29.7	9.97	0.02	1.17	1.68	1.40	0.96	0.15	0.00396	0.04971	0.00	-0.0016
110	10	7.37	0.24	11.6	Sea	11.60	86.2	12.98	0.02	1.04	1.61	1.58	0.73	0.26	0.00474	0.03963	0.00	-0.0025
110	13	6.33	0.15	11.6	Sea	24.80	78.3	8.80	0.02	1.13	1.58	1.29	1.24	0.05	0.00292	0.04654	0.00	-0.0018
110	16	6.60	0.18	11.6	Sea	20.40	68.3	10.42	0.02	1.15	1.65	1.43	1.10	0.09	0.00345	0.04846	0.00	-0.0017
110	19	7.08	0.20	8.5	Sea	26.20	16.3	10.42	0.44	1.54	4.17	3.55	2.21	1.31	0.00895	0.08662	13.10	0.0018
110	22	6.86	0.24	14.2	Sea	31.40	82.8	13.52	0.97	1.46	4.78	4.47	2.98	2.21	0.01157	0.07766	28.96	0.0010
111	1	6.30	0.16	11.6	Sea	23.10	11.4	9.12	0.02	1.35	1.88	1.40	1.26	0.10	0.00348	0.06618	0.00	-0.0001
111	4	6.38	0.19	9.8	Sea	13.40	35.0	10.73	0.02	1.13	1.67	1.49	0.81	0.21	0.00439	0.04636	0.00	-0.0019
111	7	6.87	0.24	11.6	Sea	16.20	2.7	13.18	0.79	1.38	4.70	4.39	1.68	3.20	0.01418	0.06947	23.64	0.0002
111	10	6.75	0.24	11.6	Sea	14.70	80.2	13.60	0.02	1.15	1.73	1.66	0.89	0.20	0.00436	0.04797	0.00	-0.0017
111	13	6.25	0.21	14.2	Sea	19.10	85.0	12.48	0.02	1.11	1.62	1.51	1.05	0.11	0.00359	0.04491	0.00	-0.0020
111	16	6.39	0.22	5.6	Bay	11.50	68.7	9.82	0.02	1.00	1.59	1.52	0.69	0.19	0.00426	0.03627	0.00	-0.0028
111	19	6.93	0.29	11.6	Sea	25.60	32.4	16.27	0.88	1.79	5.86	5.31	2.64	3.09	0.01391	0.11682	26.30	0.0045
111	22	6.90	0.28	14.2	Sea	33.90	78.2	16.03	1.08	1.68	5.62	5.23	3.36	2.67	0.01280	0.10251	32.49	0.0032
112	1	6.34	0.19	14.2	Sea	25.10	23.2	11.37	0.80	1.51	4.54	3.88	2.42	2.37	0.01201	0.08279	24.05	0.0014
112	4	6.29	0.16	11.6	Sea	19.70	51.8	9.59	0.02	1.17	1.66	1.37	1.08	0.10	0.00354	0.04973	0.00	-0.0016

112	7	6.79	0.24	14.2	Sea	21.90	85.4	13.82	0.02	1.23	1.78	1.65	1.20	0.10	0.00351	0.05514	0.00	-0.0011
112	10	6.84	0.33	14.2	Sea	5.90	76.1	18.68	0.02	1.34	2.03	2.01	0.48	1.05	0.00811	0.06498	0.00	-0.0002
112	13	6.35	0.17	6.7	Bay	17.70	70.0	8.31	0.02	1.01	1.50	1.33	0.95	0.09	0.00338	0.03678	0.00	-0.0027
112	16	6.34	0.18	11.6	Sea	16.30	33.2	10.54	0.02	1.19	1.71	1.45	0.95	0.16	0.00406	0.05123	0.00	-0.0014
112	19	6.87	0.22	11.6	Sea	24.50	82.5	12.29	0.02	1.25	1.80	1.60	1.29	0.07	0.00324	0.05727	0.00	-0.0009
112	22	6.98	0.18	11.6	Sea	34.80	13.9	9.70	0.53	1.76	4.47	3.40	2.92	1.27	0.00882	0.11261	15.80	0.0041
113	1	6.50	0.18	11.6	Sea	20.80	30.1	10.34	0.02	1.32	1.86	1.48	1.16	0.12	0.00370	0.06296	0.00	-0.0004
113	4	6.38	0.18	11.6	Sea	33.40	38.4	10.56	0.58	1.69	4.51	3.64	2.87	1.42	0.00928	0.10431	17.46	0.0034
113	7	6.78	0.34	4.1	Bay	16.00	46.0	9.72	0.02	1.20	1.85	1.67	0.91	0.14	0.00386	0.05233	0.00	-0.0013
113	10	6.97	0.32	4.7	Bay	17.30	35.1	10.95	0.02	1.33	2.01	1.78	1.00	0.15	0.00397	0.06441	0.00	-0.0002
113	13	6.51	0.28	3.9	Bay	19.20	47.3	7.53	0.02	1.14	1.70	1.44	1.02	0.08	0.00335	0.04701	0.00	-0.0018
113	16	6.34	0.18	8.5	Sea	14.30	78.6	9.87	0.02	0.96	1.47	1.39	0.81	0.13	0.00384	0.03375	0.00	-0.0030
113	19	6.77	0.21	8.5	Sea	13.60	58.2	10.99	0.02	1.10	1.66	1.53	0.81	0.19	0.00427	0.04409	0.00	-0.0021
113	22	6.97	0.18	8.5	Sea	26.60	66.9	9.34	0.02	1.30	1.82	1.46	1.36	0.06	0.00305	0.06131	0.00	-0.0005
114	1	6.51	0.14	11.6	Sea	21.80	28.2	7.92	0.02	1.21	1.68	1.25	1.16	0.08	0.00334	0.05327	0.00	-0.0012
114	4	6.18	0.11	5.1	Bay	28.60	11.4	4.85	0.02	1.31	1.80	1.13	1.41	0.04	0.00283	0.06247	0.00	-0.0004
114	7	6.51	0.19	4.7	Bay	22.80	18.1	7.19	0.02	1.28	1.83	1.40	1.20	0.07	0.00325	0.05924	0.00	-0.0007
114	10	6.88	0.15	9.8	Sea	6.50	56.0	7.98	0.02	0.75	1.18	1.13	0.42	0.31	0.00502	0.02052	0.00	-0.0042
114	13	6.54	0.17	3.1	Bay	20.40	81.2	2.12	0.02	0.76	1.02	0.68	0.93	0.02	0.00241	0.02075	0.00	-0.0042
114	16	6.25	0.11	14.2	Sea	26.10	52.3	6.54	0.02	1.19	1.61	1.09	1.30	0.05	0.00288	0.05140	0.00	-0.0014
114	19	6.60	0.14	8.5	Sea	17.00	43.8	7.59	0.02	1.03	1.48	1.22	0.93	0.10	0.00350	0.03826	0.00	-0.0026
114	22	6.94	0.12	11.6	Sea	30.20	16.6	6.42	0.38	1.42	3.29	2.37	2.32	0.81	0.00726	0.07294	11.39	0.0005
115	1	6.63	0.14	4.7	Bay	31.30	74.0	5.25	0.02	1.24	1.69	1.16	1.47	0.03	0.00256	0.05612	0.00	-0.0010
115	4	6.17	0.12	11.6	Sea	17.20	22.2	7.16	0.02	1.03	1.46	1.13	0.94	0.10	0.00351	0.03869	0.00	-0.0025
115	7	6.33	0.13	8.5	Sea	19.90	67.7	7.30	0.02	1.00	1.43	1.18	1.03	0.06	0.00311	0.03640	0.00	-0.0028
115	10	6.73	0.14	9.8	Sea	20.00	67.0	7.87	0.02	1.03	1.47	1.22	1.04	0.07	0.00317	0.03842	0.00	-0.0026
115	13	6.55	0.18	9.8	Sea	12.10	47.0	9.78	0.02	1.01	1.51	1.37	0.73	0.20	0.00434	0.03699	0.00	-0.0027
115	16	6.20	0.13	8.5	Sea	16.10	27.6	7.23	0.02	1.01	1.46	1.19	0.89	0.11	0.00358	0.03737	0.00	-0.0027
115	19	6.45	0.14	11.6	Sea	11.30	62.8	7.84	0.02	0.81	1.21	1.11	0.65	0.15	0.00398	0.02392	0.00	-0.0039
115	22	6.86	0.16	7.5	Bay	23.20	71.7	7.99	0.02	1.11	1.59	1.31	1.18	0.06	0.00301	0.04522	0.00	-0.0020
116	1	6.73	0.11	9.8	Sea	32.10	6.9	5.96	0.30	1.47	3.22	2.22	2.33	0.61	0.00646	0.07848	8.83	0.0010
116	4	6.28	0.10	11.6	Sea	22.40	20.3	5.97	0.02	1.13	1.55	1.06	1.15	0.06	0.00309	0.04637	0.00	-0.0019
116	7	6.28	0.13	11.6	Sea	24.70	52.1	7.38	0.02	1.20	1.65	1.20	1.26	0.06	0.00302	0.05210	0.00	-0.0013
116	10	6.69	0.16	8.5	Sea	16.40	16.7	8.69	0.02	1.13	1.64	1.36	0.93	0.13	0.00381	0.04653	0.00	-0.0018
116	13	6.69	0.16	11.6	Sea	8.90	71.2	9.04	0.02	0.81	1.25	1.20	0.55	0.24	0.00462	0.02410	0.00	-0.0039
116	16	6.31	0.13	7.5	Sea	16.30	11.7	6.83	0.02	1.02	1.48	1.18	0.89	0.10	0.00353	0.03798	0.00	-0.0026
116	19	6.37	0.12	11.6	Sea	13.90	60.7	6.74	0.02	0.82	1.19	1.02	0.76	0.10	0.00347	0.02421	0.00	-0.0039
116	22	6.84	0.20	5.1	Bay	14.40	0.7	7.56	0.02	1.05	1.57	1.35	0.81	0.13	0.00378	0.03998	0.00	-0.0024
117	1	6.89	0.16	11.6	Sea	20.30	77.2	9.00	0.02	1.03	1.47	1.27	1.06	0.07	0.00318	0.03842	0.00	-0.0026
117	4	6.45	0.15	6.1	Sea	21.00	40.4	7.02	0.02	1.14	1.64	1.28	1.10	0.07	0.00322	0.04750	0.00	-0.0018
117	7	6.30	0.13	11.6	Sea	18.80	26.5	7.48	0.02	1.09	1.54	1.18	1.02	0.09	0.00345	0.04352	0.00	-0.0021
117	10	6.63	0.14	6.1	Sea	16.10	80.2	6.59	0.02	0.83	1.25	1.13	0.84	0.07	0.00315	0.02483	0.00	-0.0038
117	13	6.74	0.17	5.6	Bay	3.50	4.7	7.11	0.02	0.72	1.20	1.17	0.24	0.40	0.00550	0.01879	0.00	-0.0043
117	16	6.39	0.18	5.1	Bay	14.90	83.9	7.43	0.02	0.85	1.33	1.26	0.80	0.09	0.00337	0.02615	0.00	-0.0037
117	19	6.27	0.16	6.1	Bay	16.80	52.1	7.76	0.02	1.03	1.53	1.31	0.92	0.10	0.00349	0.03863	0.00	-0.0026
117	22	6.68	0.17	6.1	Sea	12.50	36.3	7.93	0.02	0.97	1.47	1.31	0.72	0.15	0.00396	0.03401	0.00	-0.0030
118	1	6.92	0.15	6.1	Sea	20.80	57.6	6.81	0.02	1.06	1.53	1.23	1.07	0.06	0.00310	0.04116	0.00	-0.0023
118	4	6.59	0.14	9.8	Sea	18.80	5.2	7.97	0.02	1.16	1.64	1.27	1.03	0.10	0.00356	0.04882	0.00	-0.0016
118	7	6.49	0.64	4.7	Bay	22.30	78.4	24.13	0.50	2.08	7.56	7.48	2.16	2.42	0.01215	0.15706	14.97	0.0081
118	10	6.73	0.45	5.1	Bay	23.20	42.4	17.55	0.41	1.88	5.89	5.60	2.08	1.74	0.01024	0.12848	12.24	0.0055
118	13	6.97	0.30	5.6	Bay	17.00	64.3	12.30	0.02	1.29	1.97	1.83	0.99	0.16	0.00403	0.06016	0.00	-0.0006
118	16	6.72	0.26	7.5	Bay	25.40	47.3	13.23	0.48	1.60	4.77	4.37	2.24	1.60	0.00982	0.09294	14.48	0.0023
118	19	6.35	0.18	7.5	Bay	16.40	54.3	9.27	0.02	1.09	1.61	1.42	0.92	0.12	0.00373	0.04308	0.00	-0.0022
118	22	6.49	0.20	6.1	Sea	10.50	63.7	9.57	0.02	0.97	1.53	1.46	0.64	0.21	0.00440	0.03403	0.00	-0.0030
119	1	6.92	0.23	6.7	Bay	22.00	74.9	10.62	0.02	1.21	1.79	1.60	1.17	0.08	0.00335	0.05367	0.00	-0.0012
119	4	6.77	0.19	6.7	Sea	26.70	66.6	8.97	0.02	1.30	1.84	1.49	1.36	0.06	0.00303	0.06158	0.00	-0.0005
119	7	6.33	0.15	6.7	Bay	19.40	62.3	7.37	0.02	1.03	1.50	1.25	1.01	0.07	0.00320	0.03860	0.00	-0.0026
119	10	6.43	0.14	3.9	Bay	44.30	52.2	3.94	0.07	1.71	2.78	1.58	2.44	0.11	0.00357	0.10607	2.16	0.0035
119	13	6.85	0.22	3.9	Bay	12.90	51.6	5.46	0.02	0.81	1.26	1.11	0.69	0.09	0.00340	0.02382	0.00	-0.0039
119	16	6.79	0.25	6.7	Bay	12.10	75.0	12.16	0.02	1.12	1.76	1.70	0.75	0.23	0.00456	0.04545	0.00	-0.0019

119	19	6.39	0.24	4.7	Bay	23.70	26.1	9.25	0.22	1.43	3.58	3.15	1.77	0.70	0.00684	0.07398	6.67	0.0006
119	22	6.33	0.16	5.1	Bay	30.90	58.9	6.75	0.18	1.37	2.94	2.38	2.06	0.37	0.00534	0.06834	5.34	0.0001
120	1	6.85	0.22	5.1	Bay	16.10	43.8	8.44	0.02	1.10	1.65	1.45	0.90	0.12	0.00369	0.04383	0.00	-0.0021
120	4	6.90	0.33	6.1	Sea	8.50	62.6	14.81	0.02	1.30	2.06	2.01	0.58	0.45	0.00574	0.06103	0.00	-0.0005
120	7	6.38	0.19	7.5	Sea	22.30	17.6	9.93	0.38	1.40	3.84	3.38	1.86	1.23	0.00870	0.07124	11.46	0.0004
120	10	6.28	0.15	6.7	Bay	31.40	85.4	7.56	0.02	1.25	1.72	1.33	1.49	0.03	0.00260	0.05689	0.00	-0.0009
120	13	6.69	0.24	5.6	Bay	22.30	75.7	10.50	0.02	1.23	1.83	1.65	1.19	0.08	0.00333	0.05494	0.00	-0.0011
120	16	6.88	0.30	5.6	Bay	12.30	71.4	12.44	0.02	1.18	1.87	1.81	0.76	0.23	0.00457	0.05074	0.00	-0.0015
120	19	6.50	0.23	5.6	Bay	22.70	36.9	10.33	0.29	1.42	3.85	3.48	1.80	0.96	0.00780	0.07333	8.77	0.0006
120	22	6.24	0.13	6.7	Sea	21.70	38.3	6.42	0.02	1.13	1.59	1.19	1.12	0.07	0.00312	0.04617	0.00	-0.0019

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8905

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day Jln	time hour	depth m	H cm	T sec	srce --	Uc cm/s	Phi deg	Ub cm/s	Zo cm	u*s cm/s	u*t cm/s	u*wm cm/s	u*c cm/s	Z'o cm	Cd --	Shlds ---	Kbr cm	C* cm
121	1	6.62	0.21	5.6	Bay	14.50	66.2	9.08	0.02	1.02	1.57	1.46	0.82	0.13	0.00380	0.03755	0.00	-0.0026
121	4	6.91	0.20	4.7	Bay	26.20	62.6	6.86	0.02	1.22	1.73	1.34	1.31	0.05	0.00289	0.05408	0.00	-0.0012
121	7	6.56	0.15	4.7	Bay	19.50	62.0	5.76	0.02	0.96	1.40	1.14	0.99	0.06	0.00300	0.03371	0.00	-0.0030
121	10	6.15	0.10	11.6	Sea	24.30	79.5	5.98	0.02	0.99	1.35	1.01	1.16	0.04	0.00266	0.03595	0.00	-0.0028
121	13	6.49	0.17	5.6	Bay	17.50	51.2	7.26	0.02	1.03	1.52	1.29	0.94	0.09	0.00338	0.03847	0.00	-0.0026
121	16	6.94	0.19	5.6	Bay	27.60	72.7	7.75	0.02	1.24	1.75	1.40	1.36	0.05	0.00285	0.05601	0.00	-0.0010
121	19	6.69	0.14	6.7	Bay	35.90	53.7	6.63	0.22	1.53	3.23	2.39	2.43	0.41	0.00557	0.08568	6.61	0.0017
121	22	6.14	0.12	7.5	Sea	22.80	18.6	6.31	0.02	1.19	1.66	1.18	1.18	0.07	0.00313	0.05127	0.00	-0.0014
122	1	6.38	0.21	6.1	Bay	27.80	62.8	9.99	0.31	1.42	3.75	3.37	2.13	0.81	0.00727	0.07305	9.29	0.0005
122	4	6.83	0.30	5.1	Bay	19.90	3.8	11.77	0.30	1.50	4.24	3.91	1.64	1.17	0.00850	0.08164	8.99	0.0013
122	7	6.69	0.23	5.6	Bay	19.70	83.3	9.77	0.02	1.08	1.65	1.53	1.05	0.08	0.00333	0.04247	0.00	-0.0022
122	10	6.20	0.17	6.7	Bay	49.00	88.1	8.81	0.27	1.81	3.79	3.03	3.28	0.38	0.00543	0.11964	8.21	0.0047
122	13	6.32	0.26	4.4	Bay	41.00	37.3	9.12	0.18	1.93	4.10	3.16	2.78	0.41	0.00557	0.13583	5.42	0.0062
122	16	7.00	0.33	8.5	Sea	11.70	37.9	17.13	0.73	1.50	5.66	5.55	1.27	3.81	0.01574	0.08164	21.80	0.0013
122	19	6.96	0.29	5.6	Bay	20.20	77.0	11.86	0.02	1.26	1.91	1.78	1.12	0.11	0.00361	0.05733	0.00	-0.0009
122	22	6.39	0.17	9.8	Sea	26.40	7.0	9.87	0.48	1.52	4.08	3.40	2.25	1.39	0.00918	0.08354	14.44	0.0015
123	1	6.20	0.17	3.5	Bay	41.00	62.8	3.71	0.06	1.55	2.48	1.47	2.20	0.09	0.00340	0.08791	1.89	0.0019
123	4	6.86	0.26	6.1	Sea	22.20	9.0	11.79	0.35	1.55	4.34	3.93	1.86	1.28	0.00886	0.08687	10.59	0.0018
123	7	6.86	0.20	5.6	Bay	18.10	78.8	8.29	0.02	0.99	1.50	1.37	0.96	0.08	0.00328	0.03534	0.00	-0.0028
123	10	6.26	0.32	6.1	Bay	30.70	39.1	15.55	0.43	1.95	5.58	5.04	2.64	1.44	0.00935	0.13874	12.72	0.0065
123	13	6.15	0.08	14.2	Sea	38.90	56.1	4.96	0.35	1.52	3.18	1.94	2.74	0.51	0.00606	0.08458	10.45	0.0016
123	16	6.85	0.15	7.5	Sea	25.50	11.0	7.55	0.30	1.36	3.29	2.67	1.94	0.78	0.00714	0.06736	8.81	0.0000
123	19	7.08	0.17	6.1	Sea	38.80	79.3	7.25	0.22	1.51	3.16	2.54	2.56	0.35	0.00525	0.08340	6.56	0.0015
123	22	6.45	0.12	14.2	Sea	32.10	62.5	6.84	0.02	1.35	1.81	1.17	1.55	0.04	0.00271	0.06633	0.00	-0.0001
124	1	6.08	0.07	14.2	Sea	39.50	78.8	4.14	0.30	1.43	2.81	1.66	2.62	0.36	0.00531	0.07487	8.94	0.0007
124	4	6.57	0.18	6.7	Bay	30.00	19.5	8.83	0.29	1.58	3.79	3.07	2.27	0.77	0.00708	0.09098	8.69	0.0022
124	7	6.93	0.18	14.2	Sea	20.80	28.3	10.38	0.02	1.31	1.83	1.44	1.17	0.12	0.00371	0.06211	0.00	-0.0004
124	10	6.41	0.14	7.5	Sea	26.40	15.7	7.07	0.02	1.35	1.88	1.31	1.36	0.06	0.00311	0.06676	0.00	-0.0000
124	13	6.03	0.06	4.4	Bay	38.70	10.1	2.12	0.05	1.48	2.23	0.97	2.01	0.07	0.00314	0.07937	1.40	0.0011
124	16	6.64	0.19	11.6	Sea	27.40	42.2	10.89	0.63	1.51	4.32	3.71	2.45	1.72	0.01018	0.08271	18.86	0.0014
124	19	7.11	0.20	8.5	Sea	39.90	35.0	10.19	0.39	1.92	4.60	3.53	3.11	0.89	0.00755	0.13373	11.74	0.0060
124	22	6.64	0.20	4.1	Bay	34.90	73.6	5.91	0.13	1.39	2.68	2.11	2.12	0.21	0.00441	0.07037	3.75	0.0003
125	1	5.96	0.14	4.7	Bay	28.00	36.0	5.72	0.02	1.31	1.82	1.25	1.39	0.05	0.00288	0.06238	0.00	-0.0004
125	4	6.23	0.17	11.6	Sea	19.40	84.0	10.29	0.02	1.03	1.50	1.37	1.03	0.08	0.00332	0.03857	0.00	-0.0026
125	7	6.86	0.22	3.5	Bay	30.00	50.6	3.77	0.02	1.23	1.68	1.04	1.42	0.03	0.00260	0.05514	0.00	-0.0011
125	10	6.57	0.23	14.2	Sea	32.70	82.1	13.66	0.96	1.51	4.86	4.52	3.09	2.17	0.01144	0.08273	28.91	0.0014
125	13	5.92	0.29	3.7	Bay	21.50	3.8	8.08	0.02	1.33	1.96	1.58	1.16	0.09	0.00342	0.06451	0.00	-0.0002
125	16	6.31	0.30	5.1	Bay	20.00	61.5	12.65	0.33	1.40	4.34	4.17	1.67	1.24	0.00873	0.07132	9.93	0.0004
125	19	7.02	0.37	5.1	Bay	35.70	47.9	14.08	0.32	1.99	5.20	4.59	2.82	0.95	0.00774	0.14359	9.61	0.0069
125	22	6.77	0.41	3.3	Bay	50.10	59.3	6.00	0.09	1.98	3.40	2.22	2.86	0.14	0.00387	0.14191	2.63	0.0067
126	1	5.90	0.61	3.9	Bay	35.50	73.0	18.89	0.32	2.09	6.20	5.93	2.88	1.07	0.00818	0.15927	9.57	0.0083
126	4	6.04	0.21	6.7	Bay	38.20	26.4	10.96	0.33	1.96	4.70	3.74	2.95	0.84	0.00736	0.13911	9.91	0.0065
126	7	6.70	0.37	8.5	Sea	26.10	88.9	19.64	0.80	1.65	6.32	6.26	2.63	2.81	0.01318	0.09888	24.05	0.0029
126	10	6.77	0.31	7.5	Sea	3.10	83.7	15.48	0.02	1.23	1.97	1.97	0.25	1.05	0.00809	0.05523	0.00	-0.0011
126	13	6.15	0.17	8.5	Sea	31.80	30.6	9.50	0.39	1.63	4.08	3.29	2.53	0.98	0.00787	0.09712	11.68	0.0027
126	16	6.14	0.31	6.1	Bay	35.10	20.6	15.05	0.40	2.13	5.69	4.91	2.94	1.27	0.00883	0.16471	11.90	0.0088
126	19	6.89	0.27	6.7	Bay	24.30	19.8	12.55	0.41	1.63	4.64	4.16	2.09	1.43	0.00931	0.09682	12.19	0.0027
126	22	7.07	0.28	6.1	Sea	25.80	68.7	12.06	0.37	1.44	4.25	3.99	2.11	1.12	0.00833	0.07544	11.15	0.0008
127	1	6.39	0.18	9.8	Sea	25.20	10.8	10.27	0.50	1.50	4.14	3.52	2.19	1.51	0.00956	0.08156	15.09	0.0013
127	4	6.07	0.07	7.5	Bay	44.20	59.0	3.69	0.13	1.66	2.88	1.52	2.62	0.18	0.00418	0.09995	3.98	0.0030

127	7	6.61	0.17	7.5	Bay	29.10	37.5	8.87	0.33	1.50	3.71	3.07	2.25	0.85	0.00739	0.08163	9.96	0.0013
127	10	6.83	0.22	8.5	Sea	11.80	28.0	11.29	0.02	1.15	1.73	1.58	0.74	0.26	0.00472	0.04810	0.00	-0.0017
127	13	6.29	0.17	11.6	Sea	17.50	1.5	10.00	0.02	1.23	1.75	1.43	1.01	0.15	0.00396	0.05507	0.00	-0.0011
127	16	6.05	0.08	2.7	Bay	40.50	56.1	0.60	0.02	1.42	1.84	0.44	1.81	0.02	0.00230	0.07384	0.25	0.0006
127	19	6.69	0.17	7.5	Bay	27.20	37.8	8.49	0.33	1.42	3.53	2.95	2.10	0.84	0.00737	0.07288	9.75	0.0005
127	22	7.08	0.15	6.7	Bay	32.30	65.3	6.82	0.24	1.37	3.01	2.42	2.22	0.45	0.00574	0.06847	7.10	0.0001
128	1	6.56	0.15	9.8	Sea	17.30	82.8	8.55	0.02	0.91	1.35	1.23	0.91	0.08	0.00328	0.03036	0.00	-0.0033
128	4	6.03	0.14	6.1	Bay	29.50	69.8	6.91	0.02	1.27	1.76	1.30	1.43	0.04	0.00275	0.05864	0.00	-0.0008
128	7	6.35	0.16	7.5	Sea	17.80	67.4	8.53	0.02	1.02	1.51	1.33	0.96	0.09	0.00342	0.03819	0.00	-0.0026
128	10	6.76	0.13	7.5	Bay	19.50	3.3	6.76	0.02	1.12	1.59	1.21	1.04	0.08	0.00335	0.04583	0.00	-0.0019
128	13	6.43	0.12	8.5	Sea	2.60	45.4	6.63	0.02	0.61	1.01	1.00	0.18	0.52	0.00608	0.01373	0.00	-0.0048
128	16	6.03	0.07	9.8	Sea	31.30	31.2	4.26	0.02	1.31	1.75	0.95	1.50	0.04	0.00267	0.06272	0.00	-0.0004
128	19	6.49	0.16	7.5	Sea	19.90	42.2	8.20	0.02	1.16	1.67	1.35	1.07	0.09	0.00341	0.04907	0.00	-0.0016
128	22	6.99	0.14	9.8	Sea	31.10	76.6	7.59	0.02	1.28	1.74	1.27	1.49	0.04	0.00267	0.06005	0.00	-0.0006
129	1	6.74	0.13	8.5	Sea	21.70	66.2	6.91	0.02	1.04	1.46	1.16	1.10	0.06	0.00299	0.03917	0.00	-0.0025
129	4	6.17	0.13	9.8	Sea	20.70	89.0	7.55	0.02	0.91	1.30	1.14	1.03	0.05	0.00286	0.03001	0.00	-0.0033
129	7	6.30	0.12	8.5	Sea	21.10	50.5	6.77	0.02	1.08	1.52	1.16	1.09	0.06	0.00312	0.04219	0.00	-0.0022
129	10	6.82	0.19	8.5	Sea	19.10	23.6	9.94	0.02	1.28	1.84	1.51	1.08	0.13	0.00378	0.05971	0.00	-0.0007
129	13	6.68	0.20	8.5	Sea	12.30	31.7	10.39	0.02	1.10	1.64	1.49	0.75	0.22	0.00448	0.04398	0.00	-0.0021
129	16	6.19	0.20	9.8	Sea	17.60	86.0	11.61	0.02	1.07	1.61	1.53	0.98	0.11	0.00366	0.04152	0.00	-0.0023
129	19	6.32	0.24	3.7	Bay	10.90	53.8	5.80	0.02	0.78	1.26	1.16	0.60	0.11	0.00363	0.02237	0.00	-0.0040
129	22	6.91	0.22	6.7	Sea	21.10	0.7	10.35	0.36	1.41	3.92	3.50	1.76	1.23	0.00869	0.07259	10.65	0.0005
130	1	6.85	0.20	7.5	Bay	20.60	62.1	9.95	0.02	1.20	1.76	1.51	1.12	0.09	0.00346	0.05273	0.00	-0.0013
130	4	6.38	0.21	4.4	Bay	24.00	68.1	7.45	0.02	1.16	1.69	1.40	1.21	0.06	0.00299	0.04937	0.00	-0.0016
130	7	6.25	0.17	7.5	Sea	18.80	65.0	8.89	0.02	1.08	1.59	1.38	1.01	0.09	0.00342	0.04259	0.00	-0.0022
130	10	6.73	0.22	7.5	Sea	13.60	1.0	11.04	0.02	1.22	1.82	1.61	0.83	0.22	0.00446	0.05413	0.00	-0.0012
130	13	6.80	0.30	7.5	Bay	11.50	60.6	15.13	0.02	1.33	2.05	1.98	0.76	0.35	0.00525	0.06450	0.00	-0.0002
130	16	6.41	0.20	8.5	Sea	9.00	74.5	10.83	0.02	0.96	1.51	1.47	0.58	0.29	0.00494	0.03336	0.00	-0.0030
130	19	6.40	0.21	9.8	Sea	25.20	36.5	11.61	0.57	1.52	4.43	3.91	2.26	1.74	0.01023	0.08377	16.97	0.0015
130	22	6.88	0.27	7.5	Bay	18.00	8.9	13.36	0.50	1.49	4.72	4.41	1.68	2.07	0.01117	0.08119	15.02	0.0013
131	1	7.03	0.34	3.7	Bay	20.00	77.5	6.79	0.02	0.98	1.49	1.32	1.02	0.06	0.00302	0.03521	0.00	-0.0029
131	4	6.65	0.24	8.5	Sea	15.70	47.4	12.98	0.02	1.31	1.95	1.76	0.95	0.21	0.00439	0.06245	0.00	-0.0004
131	7	6.38	0.19	8.5	Sea	12.20	23.4	10.38	0.02	1.11	1.65	1.49	0.75	0.22	0.00451	0.04469	0.00	-0.0020
131	10	6.71	0.25	8.5	Sea	12.90	10.5	13.01	0.02	1.31	1.95	1.77	0.82	0.28	0.00488	0.06224	0.00	-0.0004
131	13	6.95	0.25	9.8	Sea	14.50	19.8	13.46	0.02	1.35	1.99	1.78	0.91	0.26	0.00474	0.06673	0.00	-0.0000
131	16	6.69	0.22	8.5	Sea	18.50	71.7	11.66	0.02	1.19	1.77	1.61	1.04	0.12	0.00374	0.05141	0.00	-0.0014
131	19	6.42	0.20	9.8	Sea	17.70	11.8	11.02	0.02	1.31	1.88	1.58	1.04	0.16	0.00407	0.06227	0.00	-0.0004
131	22	6.70	0.19	11.6	Sea	13.00	85.7	10.72	0.02	0.93	1.42	1.37	0.76	0.16	0.00408	0.03128	0.00	-0.0032
132	1	7.02	0.21	9.8	Sea	15.80	9.0	11.24	0.02	1.27	1.84	1.58	0.95	0.19	0.00428	0.05838	0.00	-0.0008
132	4	6.78	0.16	8.5	Sea	11.30	75.6	8.61	0.02	0.84	1.31	1.25	0.66	0.16	0.00404	0.02592	0.00	-0.0037
132	7	6.41	0.17	8.5	Sea	20.50	4.3	9.31	0.02	1.31	1.86	1.47	1.14	0.11	0.00364	0.06209	0.00	-0.0004
132	10	6.55	0.15	6.7	Bay	25.80	47.2	7.58	0.02	1.29	1.81	1.36	1.32	0.06	0.00306	0.06078	0.00	-0.0006
132	13	6.91	0.17	6.1	Sea	14.80	21.8	7.75	0.02	1.04	1.55	1.32	0.84	0.13	0.00377	0.03963	0.00	-0.0025
132	16	6.80	0.21	9.8	Sea	12.70	64.8	11.63	0.02	1.08	1.64	1.54	0.78	0.22	0.00447	0.04259	0.00	-0.0022
132	19	6.43	0.17	11.6	Sea	10.50	3.9	9.59	0.02	0.99	1.47	1.31	0.66	0.25	0.00471	0.03595	0.00	-0.0028
132	22	6.53	0.17	8.5	Sea	14.60	53.4	9.31	0.02	1.04	1.54	1.37	0.84	0.14	0.00391	0.03906	0.00	-0.0025
133	1	6.89	0.21	9.8	Sea	16.10	1.4	11.10	0.02	1.27	1.84	1.57	0.96	0.18	0.00423	0.05867	0.00	-0.0007
133	4	6.84	0.18	9.8	Sea	9.90	84.2	9.58	0.02	0.84	1.32	1.29	0.60	0.21	0.00443	0.02572	0.00	-0.0037
133	7	6.48	0.15	11.6	Sea	14.50	35.6	8.51	0.02	1.01	1.46	1.23	0.83	0.14	0.00390	0.03694	0.00	-0.0027
133	10	6.46	0.15	9.8	Sea	20.70	71.8	8.29	0.02	1.04	1.49	1.26	1.07	0.07	0.00314	0.03966	0.00	-0.0025
133	13	6.83	0.17	9.8	Sea	9.80	0.8	9.37	0.02	0.98	1.46	1.33	0.62	0.26	0.00475	0.03467	0.00	-0.0029
133	16	6.90	0.24	9.8	Sea	5.50	47.8	12.71	0.02	1.06	1.64	1.61	0.40	0.64	0.00661	0.04057	0.00	-0.0024
133	19	6.54	0.29	11.6	Sea	10.50	48.3	16.36	0.02	1.35	2.02	1.93	0.73	0.48	0.00588	0.06660	0.00	-0.0000
133	22	6.41	0.24	11.6	Sea	19.50	51.6	14.12	0.84	1.42	4.95	4.67	2.00	3.05	0.01380	0.07343	25.04	0.0006
134	1	6.77	0.21	9.8	Sea	14.20	43.8	11.60	0.02	1.18	1.75	1.57	0.86	0.21	0.00439	0.05087	0.00	-0.0015
134	4	6.86	0.19	11.6	Sea	4.60	25.1	10.80	0.02	0.91	1.41	1.37	0.34	0.67	0.00669	0.03016	0.00	-0.0033
134	7	6.52	0.17	8.5	Sea	7.10	24.5	9.16	0.02	0.89	1.39	1.31	0.47	0.34	0.00520	0.02905	0.00	-0.0034
134	10	6.37	0.13	8.5	Sea	19.90	41.8	7.00	0.02	1.08	1.53	1.19	1.05	0.08	0.00325	0.04257	0.00	-0.0022
134	13	6.72	0.17	6.7	Sea	17.10	59.3	8.45	0.02	1.05	1.55	1.36	0.94	0.10	0.00352	0.03980	0.00	-0.0024
134	16	6.94	0.21	11.6	Sea	10.70	25.1	11.50	0.02	1.10	1.64	1.50	0.69	0.31	0.00502	0.04430	0.00	-0.0020

134	19	6.65	0.19	9.8	Sea	11.20	12.3	10.24	0.02	1.07	1.59	1.43	0.70	0.25	0.00468	0.04147	0.00	-0.0023
134	22	6.35	0.12	9.8	Sea	15.80	52.1	6.79	0.02	0.91	1.31	1.08	0.85	0.09	0.00340	0.03006	0.00	-0.0033
135	1	6.60	0.16	8.5	Sea	12.10	50.9	8.39	0.02	0.92	1.39	1.26	0.71	0.16	0.00405	0.03104	0.00	-0.0032
135	4	6.88	0.18	9.8	Sea	16.70	23.9	9.93	0.02	1.19	1.72	1.45	0.97	0.15	0.00396	0.05194	0.00	-0.0014
135	7	6.67	0.14	5.6	Bay	15.10	41.8	6.06	0.02	0.91	1.35	1.13	0.81	0.09	0.00339	0.03002	0.00	-0.0033
135	10	6.33	0.13	6.7	Sea	11.50	25.6	6.71	0.02	0.86	1.30	1.14	0.66	0.14	0.00388	0.02718	0.00	-0.0036
135	13	6.59	0.17	8.5	Sea	9.60	87.7	8.88	0.02	0.80	1.27	1.25	0.58	0.19	0.00431	0.02304	0.00	-0.0040
135	16	6.97	0.23	4.7	Bay	13.80	80.7	7.83	0.02	0.88	1.40	1.33	0.76	0.10	0.00357	0.02790	0.00	-0.0035
135	19	6.79	0.19	9.8	Sea	15.30	88.5	10.33	0.02	0.94	1.44	1.38	0.85	0.12	0.00369	0.03231	0.00	-0.0031
135	22	6.36	0.13	9.8	Sea	14.60	72.1	7.47	0.02	0.84	1.25	1.12	0.79	0.09	0.00345	0.02589	0.00	-0.0037
136	1	6.47	0.14	7.5	Bay	15.10	63.2	7.07	0.02	0.89	1.32	1.15	0.82	0.09	0.00343	0.02863	0.00	-0.0035
136	4	6.82	0.21	4.4	Bay	13.40	49.4	6.65	0.02	0.90	1.39	1.24	0.74	0.11	0.00359	0.02961	0.00	-0.0034
136	7	6.71	0.21	6.1	Sea	7.90	75.9	9.63	0.02	0.90	1.47	1.44	0.50	0.28	0.00485	0.02963	0.00	-0.0034
136	10	6.33	0.12	6.7	Sea	10.20	5.4	5.80	0.02	0.78	1.18	1.02	0.58	0.14	0.00387	0.02201	0.00	-0.0040
136	13	6.48	0.16	5.1	Bay	26.20	20.6	6.72	0.02	1.34	1.89	1.35	1.34	0.06	0.00307	0.06566	0.00	-0.0001
136	16	6.91	0.20	3.7	Bay	16.90	65.6	4.24	0.02	0.80	1.18	0.97	0.84	0.05	0.00288	0.02313	0.00	-0.0039
136	19	6.80	0.24	8.5	Sea	18.30	20.4	12.42	0.54	1.42	4.46	4.14	1.71	2.09	0.01123	0.07297	16.17	0.0005
136	22	6.36	0.11	6.7	Sea	23.20	8.9	5.33	0.02	1.15	1.60	1.09	1.18	0.06	0.00301	0.04835	0.00	-0.0017
137	1	6.35	0.11	3.3	Bay	22.60	35.0	1.94	0.02	0.91	1.23	0.68	1.06	0.03	0.00254	0.02992	0.00	-0.0033
137	4	6.83	0.18	3.7	Bay	17.90	76.4	3.83	0.02	0.76	1.11	0.90	0.86	0.04	0.00271	0.02125	0.00	-0.0041
137	7	6.91	0.26	3.9	Bay	10.00	21.8	6.38	0.02	0.85	1.35	1.23	0.58	0.14	0.00392	0.02630	0.00	-0.0037
137	10	6.54	0.51	4.7	Bay	23.40	52.3	18.82	0.40	1.93	6.19	5.95	2.10	1.75	0.01028	0.13559	12.02	0.0062
137	13	6.55	0.64	4.7	Bay	21.60	13.7	23.77	0.48	2.33	7.70	7.41	2.11	2.50	0.01235	0.19718	13.79	0.0117
137	16	7.07	0.27	4.1	Bay	19.60	54.1	7.29	0.02	1.10	1.64	1.39	1.03	0.08	0.00326	0.04422	0.00	-0.0020
137	19	7.23	0.51	4.7	Bay	25.60	13.3	16.91	0.36	2.01	5.83	5.41	2.22	1.47	0.00945	0.14632	10.64	0.0071
137	22	6.72	0.24	4.1	Bay	25.70	20.9	6.95	0.15	1.36	2.97	2.44	1.73	0.40	0.00551	0.06702	4.45	0.0000
138	1	6.47	0.15	11.6	Sea	12.50	55.4	8.81	0.02	0.92	1.36	1.22	0.73	0.16	0.00406	0.03079	0.00	-0.0033
138	4	6.81	0.15	9.8	Sea	8.40	3.2	8.25	0.02	0.86	1.31	1.19	0.53	0.26	0.00477	0.02713	0.00	-0.0036
138	7	7.00	0.21	7.5	Bay	8.40	86.6	10.49	0.02	0.91	1.47	1.46	0.54	0.29	0.00491	0.03029	0.00	-0.0033
138	12	6.44	0.23	3.5	Bay	31.60	21.2	4.59	0.08	1.40	2.52	1.73	1.85	0.16	0.00408	0.07138	2.44	0.0004
138	15	6.66	0.20	8.5	Sea	18.80	44.8	10.68	0.02	1.26	1.83	1.57	1.07	0.13	0.00380	0.05781	0.00	-0.0008
138	18	7.17	0.38	8.5	Sea	30.30	28.6	18.99	0.70	2.14	6.70	6.07	2.98	2.57	0.01253	0.16683	20.95	0.0090
138	21	7.06	0.33	8.5	Sea	28.90	16.9	17.09	0.64	2.02	6.16	5.53	2.78	2.33	0.01190	0.14882	19.28	0.0074
138	24	6.51	0.29	8.5	Sea	12.80	3.9	15.42	0.66	1.46	5.21	5.04	1.34	3.26	0.01435	0.07748	19.82	0.0009
139	3	6.47	0.26	9.8	Sea	23.40	60.7	14.61	0.71	1.52	5.09	4.80	2.27	2.41	0.01210	0.08399	21.35	0.0015
139	6	6.95	0.30	11.6	Sea	18.20	11.7	16.80	0.94	1.65	5.82	5.47	2.01	4.00	0.01624	0.09899	28.07	0.0029
139	9	6.93	0.45	9.8	Sea	6.80	38.5	24.01	1.10	1.79	7.61	7.56	0.90	7.38	0.02474	0.11661	32.85	0.0045
139	12	6.48	0.29	11.6	Sea	20.90	56.9	16.62	0.95	1.57	5.68	5.41	2.24	3.56	0.01512	0.08977	28.32	0.0021
139	15	6.49	0.25	9.8	Sea	21.90	27.6	14.14	0.68	1.59	5.09	4.66	2.14	2.49	0.01232	0.09246	20.26	0.0023
139	18	7.03	0.29	9.8	Sea	23.60	4.7	15.39	0.71	1.76	5.55	5.04	2.34	2.66	0.01278	0.11221	21.22	0.0041
139	21	7.08	0.29	9.8	Sea	27.60	89.4	15.22	0.76	1.42	5.06	4.96	2.60	2.14	0.01136	0.07339	22.84	0.0006
139	24	6.54	0.24	9.8	Sea	16.90	25.1	13.35	0.67	1.41	4.71	4.43	1.69	2.72	0.01293	0.07205	20.11	0.0005
140	3	6.38	0.32	8.5	Sea	11.80	28.8	17.48	0.73	1.54	5.78	5.65	1.29	3.88	0.01593	0.08604	22.00	0.0017
140	6	6.83	0.37	9.8	Sea	11.70	14.7	20.05	0.94	1.68	6.55	6.41	1.39	5.18	0.01919	0.10322	28.11	0.0033
140	9	6.96	0.40	11.6	Sea	12.50	68.8	22.20	1.23	1.67	7.13	7.06	1.60	6.53	0.02258	0.10176	36.88	0.0031
140	12	6.47	0.27	11.6	Sea	11.70	2.7	15.43	0.92	1.39	5.24	5.07	1.34	4.51	0.01752	0.06993	27.63	0.0003
140	15	6.35	0.24	11.6	Sea	21.00	61.8	13.73	0.82	1.39	4.81	4.55	2.10	2.77	0.01307	0.06983	24.60	0.0003
140	18	6.89	0.33	9.8	Sea	15.80	13.3	17.95	0.84	1.67	6.04	5.79	1.75	4.01	0.01626	0.10151	25.25	0.0031
140	21	7.13	0.34	9.8	Sea	24.40	21.0	17.79	0.79	1.90	6.24	5.74	2.52	3.11	0.01395	0.13113	23.78	0.0058
140	24	6.62	0.26	11.6	Sea	21.80	59.4	14.94	0.87	1.49	5.20	4.91	2.23	3.02	0.01372	0.08030	26.03	0.0012
141	3	6.29	0.19	8.5	Sea	26.40	19.4	10.47	0.44	1.55	4.18	3.57	2.23	1.31	0.00894	0.08708	13.15	0.0018
141	6	6.65	0.20	9.8	Sea	20.10	55.2	11.29	0.02	1.28	1.84	1.58	1.13	0.12	0.00371	0.05922	0.00	-0.0007
141	9	6.91	0.27	11.6	Sea	5.80	56.5	14.97	0.02	1.17	1.80	1.77	0.44	0.78	0.00714	0.04979	0.00	-0.0015
141	12	6.54	0.20	11.6	Sea	12.80	45.5	11.67	0.02	1.13	1.67	1.52	0.79	0.24	0.00460	0.04636	0.00	-0.0019
141	15	6.27	0.12	9.8	Sea	26.80	48.8	6.79	0.02	1.25	1.72	1.20	1.34	0.05	0.00293	0.05712	0.00	-0.0009
141	18	6.72	0.18	9.8	Sea	13.80	44.8	9.80	0.02	1.06	1.56	1.39	0.81	0.17	0.00414	0.04074	0.00	-0.0024
141	21	7.12	0.21	7.5	Bay	23.80	22.5	10.12	0.39	1.45	3.94	3.44	1.97	1.20	0.00861	0.07643	11.52	0.0008
141	24	6.73	0.18	9.8	Sea	23.10	54.2	10.01	0.02	1.29	1.83	1.49	1.24	0.09	0.00338	0.06065	0.00	-0.0006
142	3	6.26	0.12	9.8	Sea	25.90	42.4	6.80	0.02	1.25	1.71	1.20	1.31	0.06	0.00299	0.05658	0.00	-0.0009
142	6	6.50	0.18	8.5	Sea	22.60	54.4	9.77	0.02	1.27	1.82	1.49	1.21	0.09	0.00338	0.05908	0.00	-0.0007

142	9	6.91	0.20	9.8	Sea	15.70	40.8	10.82	0.02	1.18	1.73	1.51	0.92	0.17	0.00412	0.05086	0.00	-0.0015
142	12	6.65	0.18	18.3	Sea	15.40	60.9	10.81	0.02	1.05	1.50	1.33	0.89	0.15	0.00400	0.04001	0.00	-0.0024
142	15	6.29	0.14	9.8	Sea	19.50	37.3	7.74	0.02	1.12	1.58	1.24	1.05	0.09	0.00340	0.04541	0.00	-0.0019
142	18	6.62	0.19	7.5	Bay	10.90	33.7	9.63	0.02	1.02	1.56	1.43	0.67	0.22	0.00451	0.03805	0.00	-0.0026
142	21	7.09	0.16	18.3	Sea	26.70	34.2	9.02	0.85	1.38	3.96	3.19	2.49	2.06	0.01114	0.06976	25.40	0.0002
142	24	6.88	0.15	8.5	Sea	41.10	76.5	7.70	0.32	1.61	3.51	2.72	2.88	0.50	0.00598	0.09421	9.52	0.0024
143	3	6.31	0.16	9.8	Sea	22.80	2.6	9.21	0.47	1.36	3.74	3.19	1.95	1.41	0.00925	0.06748	14.05	0.0000
143	6	6.41	0.18	8.5	Sea	21.10	47.4	9.80	0.02	1.26	1.81	1.49	1.15	0.10	0.00352	0.05807	0.00	-0.0008
143	9	6.86	0.19	8.5	Sea	19.60	15.7	9.70	0.02	1.29	1.85	1.50	1.10	0.12	0.00373	0.06085	0.00	-0.0006
143	12	6.71	0.18	8.5	Sea	14.60	61.9	9.52	0.02	1.02	1.53	1.38	0.84	0.14	0.00389	0.03777	0.00	-0.0026
143	15	6.26	0.27	3.9	Bay	21.20	50.0	7.81	0.02	1.20	1.78	1.49	1.12	0.08	0.00327	0.05259	0.00	-0.0013
143	18	6.33	0.30	4.7	Bay	14.80	7.5	11.67	0.02	1.35	2.06	1.86	0.89	0.20	0.00434	0.06640	0.00	-0.0001
143	21	6.91	0.23	18.3	Sea	21.30	54.8	13.03	0.02	1.35	1.89	1.59	1.21	0.13	0.00381	0.06609	0.00	-0.0001
143	24	6.97	0.20	18.3	Sea	26.80	74.3	11.52	0.02	1.31	1.80	1.47	1.38	0.06	0.00311	0.06196	0.00	-0.0005
144	3	6.37	0.16	18.3	Sea	33.30	63.7	9.85	0.90	1.50	4.21	3.43	3.00	1.78	0.01036	0.08145	26.88	0.0013
144	6	6.38	0.17	14.2	Sea	24.70	3.6	10.15	0.73	1.45	4.20	3.51	2.31	2.09	0.01124	0.07660	21.80	0.0009
144	9	6.81	0.19	7.5	Sea	23.70	84.0	9.44	0.02	1.12	1.62	1.43	1.20	0.06	0.00302	0.04579	0.00	-0.0019
144	12	6.88	0.19	7.5	Sea	12.10	39.5	9.62	0.02	1.04	1.58	1.43	0.73	0.20	0.00432	0.03953	0.00	-0.0025
144	15	6.48	0.16	14.2	Sea	25.20	20.9	9.59	0.69	1.42	4.03	3.34	2.31	1.90	0.01070	0.07295	20.80	0.0005
144	18	6.38	0.13	14.2	Sea	25.40	41.0	7.71	0.02	1.27	1.73	1.22	1.31	0.06	0.00310	0.05834	0.00	-0.0008
144	21	6.93	0.23	14.2	Sea	17.40	21.2	12.99	0.95	1.37	4.71	4.35	1.86	3.59	0.01518	0.06809	28.56	0.0001
144	24	7.07	0.21	5.6	Bay	21.30	72.6	8.47	0.02	1.11	1.63	1.42	1.11	0.07	0.00317	0.04459	0.00	-0.0020
145	3	6.59	0.17	18.3	Sea	26.80	48.8	10.33	0.97	1.40	4.23	3.57	2.59	2.38	0.01204	0.07124	28.96	0.0004
145	6	6.36	0.14	14.2	Sea	22.40	49.5	8.62	0.02	1.19	1.65	1.27	1.18	0.08	0.00327	0.05156	0.00	-0.0014
145	9	6.73	0.19	14.2	Sea	11.70	79.1	10.89	0.02	0.93	1.39	1.34	0.71	0.20	0.00438	0.03114	0.00	-0.0032
145	12	6.99	0.25	6.7	Sea	18.60	56.0	11.62	0.02	1.29	1.92	1.72	1.06	0.14	0.00386	0.06084	0.00	-0.0006
145	15	6.59	0.19	7.5	Sea	20.00	40.6	9.60	0.02	1.26	1.81	1.51	1.11	0.11	0.00360	0.05731	0.00	-0.0009
145	18	6.33	0.17	14.2	Sea	15.60	4.6	10.25	0.02	1.17	1.66	1.38	0.92	0.18	0.00418	0.04974	0.00	-0.0016
145	21	6.72	0.23	4.1	Bay	10.60	48.6	6.54	0.02	0.83	1.33	1.23	0.60	0.13	0.00383	0.02521	0.00	-0.0038
145	24	7.04	0.17	14.2	Sea	15.70	1.1	9.67	0.02	1.14	1.62	1.33	0.92	0.16	0.00407	0.04717	0.00	-0.0018
146	3	6.70	0.13	14.2	Sea	24.10	50.0	7.57	0.02	1.19	1.63	1.18	1.24	0.06	0.00307	0.05116	0.00	-0.0014
146	6	6.32	0.14	14.2	Sea	38.50	15.7	8.35	0.55	1.79	4.36	3.03	3.16	1.15	0.00842	0.11679	16.49	0.0045
146	9	6.50	0.14	11.6	Sea	19.70	82.2	7.87	0.02	0.93	1.32	1.14	1.00	0.06	0.00301	0.03138	0.00	-0.0032
146	12	6.92	0.20	14.2	Sea	6.00	30.2	11.07	0.02	0.93	1.41	1.35	0.43	0.57	0.00628	0.03162	0.00	-0.0032
146	15	6.70	0.21	14.2	Sea	18.10	21.5	12.36	0.02	1.35	1.92	1.60	1.08	0.18	0.00422	0.06654	0.00	-0.0000
146	18	6.31	0.15	14.2	Sea	35.90	47.9	8.95	0.61	1.64	4.17	3.17	3.00	1.24	0.00873	0.09754	18.33	0.0027
146	21	6.50	0.16	14.2	Sea	23.90	57.9	9.51	0.02	1.24	1.73	1.35	1.26	0.07	0.00323	0.05631	0.00	-0.0010
146	24	6.98	0.31	4.7	Bay	10.40	33.3	10.65	0.02	1.14	1.80	1.69	0.65	0.25	0.00466	0.04706	0.00	-0.0018
147	3	6.83	0.25	14.2	Sea	12.80	48.6	14.06	0.02	1.24	1.82	1.68	0.83	0.31	0.00502	0.05589	0.00	-0.0010
147	6	6.31	0.17	6.1	Sea	22.30	27.4	8.35	0.02	1.30	1.86	1.46	1.20	0.09	0.00338	0.06143	0.00	-0.0005
147	9	6.34	0.14	14.2	Sea	30.70	32.8	8.39	0.59	1.50	3.89	2.99	2.60	1.34	0.00905	0.08168	17.80	0.0013
147	12	6.87	0.20	5.1	Bay	14.80	17.6	7.80	0.02	1.07	1.60	1.38	0.84	0.13	0.00377	0.04146	0.00	-0.0023
147	15	7.03	0.58	4.7	Bay	1.90	50.9	19.96	0.45	1.64	6.35	6.34	0.20	3.58	0.01515	0.09829	13.60	0.0028
147	18	6.42	0.28	5.1	Bay	29.30	40.2	11.70	0.28	1.70	4.40	3.89	2.28	0.87	0.00747	0.10463	8.50	0.0034
147	21	6.44	0.20	3.9	Bay	13.70	7.8	5.37	0.02	0.89	1.35	1.13	0.74	0.09	0.00344	0.02880	0.00	-0.0034
147	24	6.98	0.21	6.7	Sea	10.40	2.7	9.89	0.02	1.07	1.63	1.49	0.65	0.25	0.00467	0.04135	0.00	-0.0023
148	3	7.12	0.94	5.6	Bay	4.60	42.3	38.02	0.39	2.79	9.12	9.11	0.56	5.46	0.01987	0.28217	10.58	0.0194
148	6	6.65	0.85	5.1	Bay	32.10	47.4	34.12	0.23	3.08	7.95	7.57	2.86	1.69	0.01010	0.34519	5.27	0.0250
148	9	6.51	0.67	4.4	Bay	32.70	7.6	22.82	0.27	2.61	6.85	6.27	2.76	1.31	0.00895	0.24798	6.94	0.0163
148	12	6.94	0.30	4.7	Bay	21.80	4.1	10.41	0.25	1.47	3.89	3.50	1.70	0.88	0.00750	0.07904	7.41	0.0011
148	15	7.08	0.23	4.4	Bay	26.60	80.1	6.94	0.02	1.14	1.63	1.34	1.29	0.04	0.00275	0.04741	0.00	-0.0018
148	18	6.65	0.15	6.7	Sea	22.00	43.4	7.39	0.02	1.18	1.68	1.31	1.15	0.07	0.00321	0.05061	0.00	-0.0015
148	21	6.33	0.18	14.2	Sea	16.70	37.4	10.55	0.02	1.17	1.67	1.41	0.97	0.15	0.00401	0.04985	0.00	-0.0015
148	24	6.67	0.16	7.5	Sea	2.90	23.0	7.95	0.02	0.73	1.20	1.18	0.21	0.56	0.00626	0.01959	0.00	-0.0043
149	3	6.98	0.14	5.6	Bay	20.30	67.8	5.81	0.02	0.96	1.37	1.11	1.02	0.05	0.00292	0.03321	0.00	-0.0030
149	6	6.63	0.21	6.1	Bay	13.90	19.4	9.91	0.02	1.17	1.75	1.56	0.83	0.18	0.00420	0.04946	0.00	-0.0016
149	9	6.25	0.12	11.6	Sea	26.20	50.8	6.81	0.02	1.22	1.67	1.16	1.31	0.05	0.00293	0.05412	0.00	-0.0012
149	12	6.62	0.16	11.6	Sea	22.10	61.0	9.21	0.02	1.17	1.65	1.34	1.17	0.08	0.00327	0.05018	0.00	-0.0015
149	15	7.09	0.17	5.1	Bay	15.50	56.5	6.50	0.02	0.91	1.38	1.19	0.83	0.09	0.00336	0.03036	0.00	-0.0033
149	18	6.83	0.18	3.7	Bay	28.50	85.5	3.89	0.02	1.06	1.43	0.99	1.31	0.02	0.00243	0.04065	0.00	-0.0024

149	21	6.28	0.17	4.7	Bay	23.90	27.5	6.58	0.02	1.25	1.79	1.33	1.23	0.06	0.00311	0.05721	0.00	-0.0009
149	24	6.43	0.22	14.2	Sea	11.90	44.7	12.94	0.02	1.16	1.71	1.57	0.77	0.31	0.00501	0.04918	0.00	-0.0016
150	3	6.89	0.17	11.6	Sea	22.10	32.8	9.39	0.02	1.29	1.81	1.40	1.20	0.10	0.00349	0.06084	0.00	-0.0006
150	6	6.76	0.15	9.8	Sea	18.80	59.0	8.02	0.02	1.04	1.49	1.23	1.00	0.08	0.00333	0.03922	0.00	-0.0025
150	9	6.21	0.12	14.2	Sea	31.10	76.7	7.47	0.02	1.27	1.70	1.19	1.48	0.03	0.00264	0.05827	0.00	-0.0008
150	12	6.36	0.13	8.5	Sea	26.90	13.4	7.33	0.32	1.38	3.32	2.61	2.06	0.81	0.00723	0.06952	9.63	0.0002
150	15	6.97	0.21	7.5	Sea	17.40	6.8	10.18	0.02	1.28	1.86	1.56	1.01	0.15	0.00396	0.05919	0.00	-0.0007
150	18	6.96	0.25	4.7	Bay	15.50	75.3	8.54	0.02	0.98	1.53	1.44	0.85	0.10	0.00356	0.03489	0.00	-0.0029
150	21	6.34	0.18	5.6	Bay	17.50	14.8	8.05	0.02	1.16	1.70	1.41	0.97	0.11	0.00363	0.04899	0.00	-0.0016
150	24	6.19	0.13	8.5	Sea	42.80	8.8	7.13	0.28	1.90	4.02	2.64	3.04	0.54	0.00617	0.13139	8.24	0.0058
151	3	6.66	0.23	7.5	Sea	18.50	53.7	11.83	0.02	1.30	1.92	1.71	1.06	0.14	0.00391	0.06157	0.00	-0.0005
151	6	6.77	0.20	6.7	Sea	10.70	88.4	9.79	0.02	0.89	1.44	1.42	0.64	0.19	0.00428	0.02903	0.00	-0.0034
151	9	6.23	0.15	8.5	Sea	29.00	57.4	8.59	0.38	1.38	3.51	2.98	2.25	0.87	0.00746	0.06975	11.28	0.0002
151	12	6.12	0.10	5.1	Bay	42.60	2.9	4.55	0.11	1.76	3.12	1.80	2.55	0.19	0.00426	0.11307	3.25	0.0041
151	15	6.78	0.22	6.1	Sea	18.10	30.8	10.00	0.02	1.27	1.88	1.60	1.03	0.13	0.00382	0.05890	0.00	-0.0007
151	18	7.03	0.23	6.7	Sea	27.40	79.0	10.73	0.02	1.32	1.91	1.64	1.40	0.06	0.00305	0.06384	0.00	-0.0003
151	21	6.55	0.14	7.5	Sea	27.50	52.1	7.38	0.02	1.31	1.81	1.32	1.38	0.05	0.00296	0.06217	0.00	-0.0004
151	24	6.12	0.10	11.6	Sea	30.50	31.3	5.64	0.02	1.36	1.82	1.09	1.50	0.04	0.00281	0.06694	0.00	-0.0000

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8906

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day Jln	time hour	depth m	H cm	T sec	srce --	Uc cm/s	Phi deg	Ub cm/s	Zo cm	u*s cm/s	u*t cm/s	u*wm cm/s	u*c cm/s	Z'o cm	Cd --	Shlds ---	Kbr cm	C* cm
152	3	6.50	0.18	8.5	Sea	16.50	67.0	9.50	0.02	1.04	1.55	1.39	0.92	0.11	0.00366	0.03940	0.00	-0.0025
152	6	6.90	0.25	6.7	Sea	16.90	42.9	11.64	0.02	1.30	1.94	1.72	0.99	0.16	0.00409	0.06150	0.00	-0.0005
152	9	6.49	0.18	7.5	Sea	16.20	40.1	9.19	0.02	1.12	1.65	1.42	0.92	0.13	0.00382	0.04585	0.00	-0.0019
152	12	6.15	0.12	9.8	Sea	31.30	58.1	6.69	0.02	1.35	1.83	1.21	1.52	0.04	0.00276	0.06660	0.00	-0.0000
152	15	6.68	0.21	5.1	Bay	17.20	76.0	8.38	0.02	0.99	1.53	1.40	0.92	0.09	0.00339	0.03593	0.00	-0.0028
152	18	7.19	0.21	6.7	Sea	37.40	74.1	9.67	0.32	1.60	3.83	3.28	2.73	0.62	0.00651	0.09278	9.48	0.0023
152	21	6.87	0.12	7.5	Bay	47.70	2.5	5.99	0.20	2.01	3.90	2.30	3.15	0.35	0.00527	0.14657	5.98	0.0072
152	24	6.22	0.10	8.5	Sea	23.80	44.3	5.27	0.02	1.10	1.51	1.03	1.18	0.05	0.00288	0.04377	0.00	-0.0021
153	3	6.41	0.12	7.5	Sea	20.10	48.5	6.49	0.02	1.04	1.48	1.15	1.04	0.07	0.00314	0.03970	0.00	-0.0025
153	6	6.97	0.16	7.5	Sea	15.10	14.0	7.85	0.02	1.05	1.54	1.28	0.85	0.13	0.00379	0.04016	0.00	-0.0024
153	9	6.73	0.14	9.8	Sea	17.30	8.5	7.82	0.02	1.10	1.57	1.24	0.96	0.11	0.00363	0.04402	0.00	-0.0021
153	12	6.21	0.12	9.8	Sea	32.90	37.6	7.00	0.34	1.50	3.44	2.54	2.46	0.71	0.00686	0.08178	10.28	0.0013
153	15	6.47	0.14	5.1	Bay	19.90	58.4	5.74	0.02	0.98	1.42	1.13	1.01	0.06	0.00300	0.03512	0.00	-0.0029
153	18	7.14	0.17	5.6	Bay	25.60	23.2	6.94	0.02	1.33	1.87	1.35	1.32	0.06	0.00311	0.06420	0.00	-0.0003
153	21	7.07	0.15	4.7	Bay	30.60	2.7	5.28	0.13	1.41	2.76	1.96	1.94	0.27	0.00484	0.07266	3.82	0.0005
153	24	6.28	0.10	9.8	Sea	27.90	17.8	5.41	0.02	1.29	1.74	1.07	1.39	0.05	0.00288	0.06027	0.00	-0.0006
154	3	6.40	0.10	7.5	Bay	28.40	17.1	5.14	0.02	1.30	1.77	1.09	1.40	0.05	0.00285	0.06140	0.00	-0.0005
154	6	6.83	0.14	6.7	Bay	14.60	78.6	6.63	0.02	0.79	1.21	1.10	0.77	0.08	0.00328	0.02294	0.00	-0.0040
154	9	6.92	0.15	7.5	Sea	12.60	37.5	7.45	0.02	0.92	1.37	1.20	0.72	0.14	0.00388	0.03059	0.00	-0.0033
154	12	6.30	0.10	9.8	Sea	26.70	6.3	5.92	0.02	1.29	1.76	1.13	1.35	0.05	0.00298	0.06029	0.00	-0.0006
154	15	6.33	0.11	8.5	Sea	27.60	29.6	6.04	0.02	1.30	1.78	1.16	1.38	0.05	0.00293	0.06153	0.00	-0.0005
154	18	7.00	0.17	6.7	Sea	15.20	17.2	8.14	0.02	1.08	1.59	1.34	0.86	0.13	0.00381	0.04232	0.00	-0.0022
154	21	7.11	0.10	14.2	Sea	42.70	1.2	5.82	0.38	1.80	3.88	2.27	3.15	0.66	0.00668	0.11832	11.45	0.0046
154	24	6.49	0.13	8.5	Sea	31.10	46.7	6.97	0.30	1.41	3.24	2.50	2.27	0.63	0.00655	0.07280	9.07	0.0005
155	3	6.16	0.08	8.5	Sea	30.80	35.0	4.30	0.02	1.30	1.74	0.97	1.48	0.04	0.00267	0.06105	0.00	-0.0005
155	6	6.63	0.14	8.5	Sea	13.60	33.5	7.51	0.02	0.95	1.39	1.19	0.77	0.13	0.00381	0.03265	0.00	-0.0031
155	9	6.89	0.19	5.6	Bay	9.80	46.1	8.05	0.02	0.90	1.42	1.32	0.59	0.19	0.00428	0.02934	0.00	-0.0034
155	12	6.44	0.14	5.6	Bay	14.50	14.4	6.25	0.02	0.95	1.40	1.16	0.80	0.10	0.00355	0.03263	0.00	-0.0031
155	15	6.13	0.08	5.6	Bay	39.40	63.4	3.61	0.10	1.48	2.51	1.45	2.25	0.14	0.00387	0.08014	3.01	0.0012
155	18	6.78	0.21	5.1	Bay	14.00	52.1	8.22	0.02	1.00	1.54	1.39	0.79	0.13	0.00379	0.03667	0.00	-0.0027
155	21	7.18	0.25	5.1	Bay	20.30	82.1	9.11	0.02	1.07	1.62	1.49	1.07	0.07	0.00323	0.04171	0.00	-0.0023
155	24	6.74	0.17	9.8	Sea	24.00	41.7	9.29	0.02	1.33	1.86	1.44	1.28	0.08	0.00334	0.06432	0.00	-0.0002
156	3	6.19	0.09	8.5	Sea	34.80	26.0	5.01	0.21	1.49	2.99	1.92	2.34	0.39	0.00546	0.08038	6.39	0.0012
156	6	6.54	0.17	6.1	Bay	26.40	45.7	8.11	0.02	1.35	1.91	1.45	1.36	0.06	0.00311	0.06676	0.00	-0.0000
156	9	7.01	0.19	6.7	Sea	5.80	44.2	8.93	0.02	0.86	1.38	1.34	0.39	0.37	0.00535	0.02680	0.00	-0.0036
156	12	6.70	0.20	6.7	Sea	16.30	40.7	9.72	0.02	1.17	1.73	1.51	0.93	0.14	0.00388	0.04967	0.00	-0.0016
156	15	6.19	0.12	5.6	Bay	26.10	26.6	5.42	0.02	1.24	1.72	1.16	1.30	0.05	0.00291	0.05605	0.00	-0.0010
156	18	6.56	0.20	5.6	Bay	8.90	87.9	8.68	0.02	0.83	1.37	1.36	0.54	0.20	0.00437	0.02479	0.00	-0.0038
156	21	7.12	0.21	6.7	Sea	19.50	38.4	9.79	0.02	1.27	1.85	1.56	1.09	0.11	0.00367	0.05861	0.00	-0.0008
156	24	6.88	0.17	5.6	Bay	25.50	86.6	6.89	0.02	1.05	1.49	1.25	1.23	0.04	0.00269	0.04043	0.00	-0.0024
157	3	6.26	0.15	9.8	Sea	31.80	13.3	8.57	0.41	1.61	3.94	3.03	2.54	0.99	0.00790	0.09397	12.24	0.0024
157	6	6.35	0.18	7.5	Bay	31.00	25.2	9.59	0.35	1.64	4.06	3.31	2.43	0.92	0.00763	0.09760	10.39	0.0028
157	9	6.84	0.22	6.1	Sea	19.80	4.2	9.79	0.02	1.35	1.96	1.61	1.11	0.12	0.00374	0.06588	0.00	-0.0001
157	12	6.76	0.20	6.7	Sea	8.60	77.6	9.42	0.02	0.88	1.42	1.39	0.54	0.25	0.00467	0.02808	0.00	-0.0035
157	15	6.29	0.16	9.8	Sea	12.20	53.8	9.22	0.02	0.96	1.43	1.31	0.72	0.18	0.00418	0.03337	0.00	-0.0030
157	18	6.40	0.14	6.7	Sea	28.30	46.6	7.21	0.02	1.35	1.88	1.34	1.42	0.05	0.00296	0.06647	0.00	-0.0000
157	21	7.05	0.33	4.4	Bay	7.80	8.3	10.10	0.02	1.07	1.72	1.64	0.50	0.30	0.00499	0.04129	0.00	-0.0023
157	24	7.03	0.20	4.7	Bay	12.10	88.5	6.82	0.02	0.75	1.22	1.19	0.66	0.10	0.00351	0.02028	0.00	-0.0042
158	3	6.41	0.13	9.8	Sea	13.10	9.3	7.54	0.02	0.95	1.39	1.17	0.75	0.15	0.00394	0.03303	0.00	-0.0031
158	6	6.30	0.12	8.5	Sea	30.20	48.3	6.55	0.29	1.36	3.07	2.36	2.18	0.59	0.00638	0.06707	8.67	0.0000

158	9	6.79	0.19	5.1	Bay	10.30	45.6	7.54	0.02	0.88	1.39	1.29	0.61	0.17	0.00410	0.02838	0.00	-0.0035
158	12	6.96	0.29	6.1	Sea	13.90	63.3	12.66	0.02	1.24	1.92	1.82	0.85	0.21	0.00444	0.05584	0.00	-0.0010
158	15	6.45	0.26	6.7	Bay	16.00	74.7	12.79	0.02	1.22	1.88	1.79	0.94	0.17	0.00413	0.05427	0.00	-0.0011
158	18	6.29	0.18	6.7	Sea	26.40	56.9	9.38	0.33	1.37	3.60	3.19	2.05	0.86	0.00744	0.06811	9.78	0.0001
158	21	6.89	0.23	6.1	Sea	11.90	2.6	10.40	0.02	1.15	1.76	1.60	0.73	0.23	0.00452	0.04841	0.00	-0.0017
158	24	7.14	0.30	6.1	Sea	12.00	65.2	12.83	0.02	1.21	1.90	1.82	0.75	0.26	0.00472	0.05317	0.00	-0.0012
159	3	6.63	0.21	6.7	Sea	17.30	49.9	10.14	0.02	1.19	1.77	1.56	0.98	0.13	0.00381	0.05173	0.00	-0.0014
159	6	6.31	0.15	9.8	Sea	22.70	34.6	8.47	0.02	1.27	1.77	1.35	1.21	0.08	0.00334	0.05825	0.00	-0.0008
159	9	6.66	0.21	6.1	Bay	18.00	25.4	9.55	0.02	1.25	1.84	1.56	1.02	0.13	0.00378	0.05699	0.00	-0.0009
159	12	7.01	0.28	6.1	Sea	9.80	84.6	12.28	0.02	1.08	1.75	1.73	0.63	0.29	0.00492	0.04263	0.00	-0.0022
159	15	6.68	0.25	6.7	Sea	15.20	26.2	12.07	0.02	1.32	1.98	1.77	0.92	0.20	0.00438	0.06366	0.00	-0.0003
159	18	6.34	0.18	9.8	Sea	19.90	0.2	10.20	0.02	1.33	1.89	1.52	1.13	0.13	0.00380	0.06447	0.00	-0.0002
159	21	6.63	0.21	6.1	Bay	13.70	25.6	9.91	0.02	1.15	1.74	1.55	0.81	0.18	0.00420	0.04828	0.00	-0.0017
159	24	7.02	0.25	6.7	Sea	9.60	39.1	11.77	0.02	1.14	1.77	1.68	0.62	0.32	0.00508	0.04716	0.00	-0.0018
160	3	6.73	0.21	5.6	Bay	9.40	69.8	9.08	0.02	0.91	1.47	1.42	0.57	0.21	0.00445	0.03008	0.00	-0.0033
160	6	6.32	0.14	8.5	Sea	12.40	9.5	7.97	0.02	0.97	1.43	1.24	0.73	0.16	0.00408	0.03424	0.00	-0.0029
160	9	6.45	0.17	8.5	Sea	16.30	49.1	8.95	0.02	1.07	1.57	1.36	0.92	0.12	0.00372	0.04185	0.00	-0.0023
160	12	6.86	0.21	9.8	Sea	6.60	35.4	11.30	0.02	1.00	1.54	1.48	0.46	0.48	0.00589	0.03621	0.00	-0.0028
160	15	6.76	0.21	6.7	Sea	7.20	54.0	9.90	0.02	0.94	1.50	1.45	0.47	0.34	0.00518	0.03209	0.00	-0.0031
160	18	6.32	0.17	8.5	Sea	8.20	9.0	9.17	0.02	0.93	1.43	1.33	0.53	0.30	0.00497	0.03158	0.00	-0.0032
160	21	6.43	0.20	8.5	Sea	13.50	29.9	10.81	0.02	1.16	1.73	1.54	0.82	0.21	0.00440	0.04912	0.00	-0.0016
160	24	6.89	0.22	7.5	Sea	9.80	16.5	11.11	0.02	1.11	1.70	1.58	0.63	0.30	0.00501	0.04500	0.00	-0.0020
161	3	6.80	0.20	6.1	Sea	8.00	76.1	8.89	0.02	0.85	1.39	1.36	0.50	0.25	0.00467	0.02633	0.00	-0.0037
161	6	6.39	0.18	8.5	Sea	16.90	6.6	9.77	0.02	1.22	1.77	1.48	0.98	0.15	0.00395	0.05438	0.00	-0.0011
161	9	6.41	0.15	9.8	Sea	27.30	16.2	8.56	0.43	1.46	3.72	3.00	2.23	1.11	0.00831	0.07715	12.72	0.0009
161	12	6.88	0.25	8.5	Sea	8.40	62.1	13.11	0.02	1.13	1.76	1.71	0.57	0.42	0.00561	0.04626	0.00	-0.0019
161	15	6.93	0.26	8.5	Sea	5.70	75.0	13.57	0.02	1.10	1.75	1.74	0.42	0.63	0.00654	0.04431	0.00	-0.0020
161	18	6.55	0.19	9.8	Sea	15.20	10.7	10.34	0.02	1.19	1.73	1.48	0.90	0.18	0.00420	0.05164	0.00	-0.0014
161	21	6.49	0.16	9.8	Sea	17.20	7.6	8.77	0.02	1.16	1.66	1.34	0.97	0.13	0.00379	0.04870	0.00	-0.0016
161	24	6.92	0.20	8.5	Sea	3.30	17.0	10.42	0.02	0.90	1.44	1.42	0.25	0.73	0.00693	0.02949	0.00	-0.0034
162	3	7.06	0.70	4.7	Bay	7.00	2.8	23.82	0.50	1.98	7.45	7.41	0.75	3.61	0.01523	0.14310	15.05	0.0068
162	6	6.65	0.61	4.7	Bay	19.30	43.5	22.24	0.46	2.09	7.12	6.93	1.87	2.39	0.01206	0.15945	13.75	0.0083
162	9	6.55	0.54	4.1	Bay	21.80	4.3	16.29	0.31	1.89	5.53	5.21	1.86	1.37	0.00912	0.12927	9.15	0.0056
162	12	6.83	0.34	4.7	Bay	6.70	57.2	11.92	0.02	1.12	1.84	1.80	0.45	0.40	0.00552	0.04578	0.00	-0.0019
162	15	7.02	0.20	4.4	Bay	14.20	29.1	6.22	0.02	0.94	1.42	1.21	0.78	0.10	0.00352	0.03187	0.00	-0.0032
162	18	6.68	0.17	9.8	Sea	14.20	58.9	9.39	0.02	1.00	1.48	1.33	0.82	0.14	0.00393	0.03634	0.00	-0.0028
162	21	6.45	0.14	9.8	Sea	8.20	56.8	7.57	0.02	0.76	1.17	1.10	0.50	0.22	0.00449	0.02076	0.00	-0.0042
162	24	6.67	0.13	8.5	Sea	0.40	74.1	7.01	0.02	0.62	1.04	1.04	0.03	0.99	0.00790	0.01401	0.00	-0.0048
163	3	6.85	0.13	9.8	Sea	11.60	36.9	7.25	0.02	0.86	1.27	1.11	0.67	0.15	0.00397	0.02672	0.00	-0.0036
163	6	6.58	0.18	9.8	Sea	11.10	87.7	9.81	0.02	0.86	1.34	1.31	0.66	0.18	0.00421	0.02668	0.00	-0.0036
163	9	6.34	0.15	9.8	Sea	24.20	85.7	8.61	0.02	1.07	1.51	1.28	1.20	0.05	0.00286	0.04140	0.00	-0.0023
163	12	6.64	0.15	8.5	Sea	8.40	79.0	7.88	0.02	0.74	1.18	1.15	0.51	0.20	0.00438	0.01996	0.00	-0.0042
167	10	6.81	0.21	5.6	Bay	6.20	9.5	8.85	0.02	0.91	1.46	1.40	0.41	0.33	0.00517	0.02987	0.00	-0.0033
167	13	6.70	0.20	6.7	Sea	21.50	60.2	9.67	0.02	1.23	1.79	1.53	1.16	0.09	0.00339	0.05514	0.00	-0.0011
167	16	7.16	0.23	8.5	Sea	5.80	1.0	11.51	0.02	1.03	1.60	1.55	0.41	0.54	0.00616	0.03846	0.00	-0.0026
167	19	7.42	0.26	8.5	Sea	16.70	63.4	13.07	0.02	1.28	1.91	1.76	0.99	0.18	0.00418	0.05923	0.00	-0.0007
167	22	6.88	0.17	8.5	Sea	18.40	37.9	9.11	0.02	1.18	1.70	1.41	1.02	0.11	0.00365	0.05027	0.00	-0.0015
168	1	6.52	0.16	8.5	Sea	28.60	14.5	8.62	0.37	1.51	3.76	3.02	2.26	0.95	0.00777	0.08340	10.92	0.0015
168	4	6.82	0.20	6.1	Sea	18.10	19.5	9.10	0.02	1.23	1.81	1.51	1.02	0.12	0.00373	0.05544	0.00	-0.0010
168	7	7.12	0.25	6.1	Sea	11.90	50.9	10.86	0.02	1.12	1.73	1.62	0.73	0.22	0.00448	0.04541	0.00	-0.0019
168	10	6.85	0.23	9.8	Sea	7.50	59.7	12.33	0.02	1.05	1.62	1.58	0.52	0.45	0.00577	0.03993	0.00	-0.0024
168	13	6.56	0.17	6.1	Sea	29.30	43.5	7.67	0.24	1.43	3.30	2.69	2.10	0.56	0.00627	0.07415	7.12	0.0006
168	16	7.00	0.23	8.5	Sea	10.90	46.6	12.04	0.02	1.14	1.74	1.63	0.70	0.29	0.00493	0.04730	0.00	-0.0018
168	19	7.35	0.25	5.1	Bay	17.10	61.3	8.99	0.02	1.10	1.67	1.50	0.94	0.11	0.00359	0.04386	0.00	-0.0021
168	22	7.03	0.18	11.6	Sea	23.20	26.6	9.99	0.60	1.38	3.98	3.44	2.09	1.77	0.01034	0.06909	17.94	0.0002
169	1	6.56	0.14	11.6	Sea	28.00	24.2	7.77	0.46	1.41	3.55	2.77	2.28	1.10	0.00828	0.07220	13.82	0.0005
169	4	6.75	0.16	7.5	Sea	18.00	71.5	8.23	0.02	0.99	1.46	1.29	0.96	0.08	0.00332	0.03583	0.00	-0.0028
169	7	7.16	0.21	5.1	Bay	13.40	70.7	7.65	0.02	0.89	1.40	1.30	0.74	0.11	0.00364	0.02876	0.00	-0.0034
169	10	6.98	0.18	9.8	Sea	26.30	31.5	9.41	0.47	1.44	3.87	3.25	2.21	1.28	0.00885	0.07557	14.04	0.0008
169	13	6.58	0.16	9.8	Sea	37.20	40.8	8.92	0.41	1.73	4.14	3.14	2.90	0.88	0.00752	0.10881	12.38	0.0038

169	16	6.89	0.20	4.7	Bay	16.30	64.1	6.92	0.02	0.94	1.43	1.26	0.87	0.08	0.00333	0.03215	0.00	-0.0031
169	19	7.38	0.23	8.5	Sea	22.00	43.2	11.58	0.50	1.41	4.25	3.88	1.96	1.67	0.01003	0.07234	15.09	0.0005
169	22	7.23	0.14	9.8	Sea	19.60	86.7	7.59	0.02	0.90	1.29	1.14	0.99	0.05	0.00295	0.02925	0.00	-0.0034
170	1	6.65	0.13	9.8	Sea	18.70	0.7	7.27	0.02	1.11	1.57	1.20	1.02	0.09	0.00347	0.04501	0.00	-0.0020
170	4	6.73	0.17	9.8	Sea	13.40	37.3	9.40	0.02	1.04	1.53	1.35	0.79	0.17	0.00416	0.03947	0.00	-0.0025
170	7	7.17	0.17	9.8	Sea	13.70	11.9	8.94	0.02	1.06	1.54	1.32	0.81	0.17	0.00412	0.04075	0.00	-0.0024
170	10	7.12	0.17	8.5	Sea	20.60	75.0	8.70	0.02	1.06	1.53	1.32	1.07	0.07	0.00318	0.04049	0.00	-0.0024
170	13	6.64	0.14	8.5	Sea	27.10	12.4	7.72	0.34	1.41	3.44	2.73	2.10	0.86	0.00743	0.07269	10.05	0.0005
170	16	6.75	0.16	8.5	Sea	26.60	47.4	8.48	0.02	1.35	1.88	1.41	1.37	0.06	0.00312	0.06648	0.00	-0.0000
170	19	7.33	0.19	9.8	Sea	21.20	21.5	9.86	0.02	1.33	1.88	1.49	1.18	0.11	0.00364	0.06454	0.00	-0.0002
170	22	7.37	0.15	8.5	Sea	33.10	34.8	7.66	0.32	1.56	3.60	2.73	2.47	0.70	0.00684	0.08835	9.59	0.0019
171	1	6.78	0.14	9.8	Sea	19.60	31.2	7.84	0.02	1.14	1.61	1.26	1.06	0.09	0.00343	0.04736	0.00	-0.0018
171	4	6.66	0.14	8.5	Sea	30.90	30.3	7.44	0.32	1.49	3.46	2.66	2.32	0.72	0.00691	0.08048	9.49	0.0012
171	7	7.16	0.19	8.5	Sea	15.70	37.3	9.78	0.02	1.14	1.68	1.45	0.91	0.15	0.00397	0.04744	0.00	-0.0018
171	10	7.27	0.17	8.5	Sea	10.20	80.5	8.63	0.02	0.81	1.28	1.24	0.61	0.18	0.00419	0.02393	0.00	-0.0039
171	13	6.78	0.17	8.5	Sea	17.90	0.8	8.77	0.02	1.19	1.71	1.38	1.01	0.12	0.00373	0.05169	0.00	-0.0014
171	16	6.69	0.19	8.5	Sea	21.20	45.1	9.85	0.02	1.28	1.83	1.50	1.16	0.10	0.00353	0.05944	0.00	-0.0007
171	19	7.25	0.19	7.5	Sea	22.00	21.9	8.99	0.02	1.32	1.88	1.48	1.20	0.10	0.00349	0.06380	0.00	-0.0003
171	22	7.49	0.17	8.5	Sea	26.20	69.4	8.51	0.02	1.23	1.72	1.37	1.32	0.05	0.00296	0.05513	0.00	-0.0011
172	1	7.00	0.16	8.5	Sea	16.10	40.5	8.08	0.02	1.04	1.51	1.27	0.90	0.11	0.00365	0.03926	0.00	-0.0025
172	4	6.66	0.10	9.8	Sea	35.00	86.0	5.28	0.02	1.28	1.69	1.05	1.60	0.02	0.00240	0.05986	0.00	-0.0006
172	7	7.10	0.19	8.5	Sea	12.90	88.3	9.69	0.02	0.88	1.38	1.35	0.74	0.14	0.00390	0.02846	0.00	-0.0035
172	10	7.38	0.18	7.5	Sea	7.30	55.2	8.63	0.02	0.84	1.33	1.28	0.47	0.29	0.00490	0.02559	0.00	-0.0037
172	13	6.95	0.18	7.5	Sea	25.90	6.9	8.81	0.34	1.46	3.68	3.06	2.05	0.95	0.00776	0.07705	10.01	0.0009
172	16	6.64	0.10	7.5	Sea	28.60	27.4	5.26	0.02	1.30	1.77	1.10	1.41	0.05	0.00283	0.06127	0.00	-0.0005
172	19	7.09	0.19	6.7	Sea	16.90	58.8	8.71	0.02	1.06	1.58	1.39	0.93	0.11	0.00358	0.04082	0.00	-0.0024
172	22	7.54	0.18	5.6	Bay	16.00	54.1	6.97	0.02	0.96	1.43	1.24	0.86	0.09	0.00342	0.03343	0.00	-0.0030
173	1	7.13	0.17	7.5	Sea	17.90	70.5	8.02	0.02	0.98	1.45	1.27	0.95	0.08	0.00331	0.03513	0.00	-0.0029
173	4	6.66	0.13	8.5	Sea	34.30	36.6	6.75	0.28	1.54	3.39	2.46	2.46	0.57	0.00631	0.08645	8.49	0.0018
173	7	6.93	0.15	8.5	Sea	34.10	48.7	7.56	0.32	1.53	3.51	2.69	2.51	0.65	0.00663	0.08555	9.53	0.0017
173	10	7.38	0.17	9.8	Sea	10.40	13.8	8.53	0.02	0.93	1.39	1.24	0.64	0.22	0.00446	0.03174	0.00	-0.0032
173	13	7.10	0.18	8.5	Sea	21.90	20.7	9.23	0.02	1.33	1.88	1.47	1.20	0.10	0.00353	0.06418	0.00	-0.0003
173	16	6.63	0.14	9.8	Sea	22.50	38.2	7.45	0.02	1.19	1.66	1.24	1.18	0.07	0.00321	0.05149	0.00	-0.0014
173	19	6.92	0.16	8.5	Sea	18.90	75.8	8.24	0.02	0.98	1.44	1.26	0.99	0.07	0.00321	0.03519	0.00	-0.0029
173	22	7.44	0.18	14.2	Sea	23.20	45.6	10.03	0.02	1.31	1.82	1.42	1.25	0.09	0.00343	0.06201	0.00	-0.0004
174	1	7.24	0.16	9.8	Sea	22.60	89.1	8.32	0.02	0.99	1.41	1.23	1.12	0.05	0.00285	0.03559	0.00	-0.0028
174	4	6.69	0.13	8.5	Sea	23.20	11.4	6.99	0.02	1.24	1.73	1.24	1.22	0.07	0.00322	0.05626	0.00	-0.0010
174	7	6.78	0.20	11.6	Sea	32.60	5.9	10.93	0.59	1.77	4.73	3.77	2.86	1.57	0.00975	0.11346	17.77	0.0042
174	10	7.36	0.18	8.5	Sea	10.40	24.0	9.01	0.02	0.97	1.46	1.33	0.64	0.22	0.00452	0.03421	0.00	-0.0030
174	13	7.27	0.29	14.2	Sea	18.70	45.1	16.24	1.14	1.52	5.63	5.32	2.13	4.46	0.01737	0.08439	34.22	0.0016
174	16	6.73	0.16	14.2	Sea	26.40	10.7	9.34	0.67	1.46	4.04	3.27	2.38	1.78	0.01037	0.07701	20.03	0.0009
174	19	6.81	0.18	11.6	Sea	18.00	39.9	9.95	0.02	1.18	1.69	1.41	1.02	0.13	0.00379	0.05091	0.00	-0.0014
174	22	7.36	0.21	11.6	Sea	23.30	7.8	11.17	0.65	1.48	4.37	3.80	2.18	2.07	0.01117	0.07963	19.50	0.0011
175	1	7.40	0.17	11.6	Sea	25.20	69.6	9.11	0.02	1.21	1.69	1.35	1.28	0.06	0.00303	0.05332	0.00	-0.0012
175	4	6.82	0.13	11.6	Sea	24.80	23.5	7.15	0.02	1.27	1.75	1.21	1.29	0.07	0.00314	0.05875	0.00	-0.0007
175	7	6.73	0.13	11.6	Sea	30.30	31.1	7.49	0.44	1.45	3.55	2.69	2.41	0.98	0.00784	0.07665	13.16	0.0009
175	10	7.28	0.19	9.8	Sea	12.90	67.5	10.11	0.02	0.98	1.48	1.38	0.76	0.17	0.00415	0.03514	0.00	-0.0029
175	13	7.46	0.18	9.8	Sea	15.60	75.7	9.24	0.02	0.95	1.42	1.30	0.86	0.11	0.00361	0.03297	0.00	-0.0031
175	16	6.97	0.14	9.8	Sea	24.50	24.6	7.65	0.02	1.30	1.80	1.29	1.28	0.07	0.00321	0.06131	0.00	-0.0005
175	19	6.77	0.15	9.8	Sea	22.20	9.4	8.39	0.02	1.29	1.81	1.35	1.20	0.09	0.00343	0.06051	0.00	-0.0006
175	22	7.26	0.14	8.5	Sea	19.60	51.8	6.98	0.02	1.04	1.48	1.17	1.03	0.07	0.00320	0.03932	0.00	-0.0025
176	1	7.48	0.18	11.6	Sea	14.90	47.8	9.75	0.02	1.06	1.54	1.35	0.86	0.15	0.00399	0.04092	0.00	-0.0023
176	4	7.01	0.18	11.6	Sea	22.00	31.3	10.06	0.02	1.33	1.87	1.47	1.21	0.11	0.00358	0.06467	0.00	-0.0002
176	7	6.74	0.14	9.8	Sea	32.50	17.0	7.92	0.38	1.59	3.78	2.83	2.53	0.88	0.00749	0.09165	11.37	0.0022
176	10	7.17	0.20	5.1	Bay	22.20	76.9	7.46	0.02	1.06	1.55	1.33	1.12	0.05	0.00298	0.04061	0.00	-0.0024
176	13	7.51	0.22	4.4	Bay	12.70	57.7	6.19	0.02	0.83	1.30	1.17	0.69	0.10	0.00353	0.02503	0.00	-0.0038
176	16	7.17	0.21	5.6	Bay	23.00	36.9	8.56	0.02	1.32	1.90	1.51	1.23	0.08	0.00334	0.06306	0.00	-0.0004
176	19	6.75	0.13	9.8	Sea	25.20	39.5	7.31	0.02	1.26	1.74	1.25	1.29	0.06	0.00309	0.05802	0.00	-0.0008
176	22	6.99	0.19	9.8	Sea	15.50	73.0	9.94	0.02	1.00	1.50	1.38	0.87	0.12	0.00376	0.03660	0.00	-0.0027
177	1	7.40	0.22	9.8	Sea	11.60	14.2	11.30	0.02	1.14	1.70	1.54	0.73	0.27	0.00481	0.04766	0.00	-0.0017

177	4	7.13	0.21	9.8	Sea	15.00	61.6	10.93	0.02	1.10	1.64	1.49	0.88	0.16	0.00407	0.04405	0.00	-0.0021
177	7	6.69	0.17	8.5	Sea	30.10	3.8	8.95	0.37	1.59	3.93	3.13	2.39	0.97	0.00782	0.09223	11.12	0.0023
177	10	6.93	0.20	9.8	Sea	21.50	61.8	10.90	0.02	1.26	1.81	1.54	1.17	0.10	0.00351	0.05763	0.00	-0.0008
177	13	7.49	0.27	7.5	Sea	15.00	13.7	12.49	0.02	1.35	2.00	1.78	0.92	0.22	0.00451	0.06604	0.00	-0.0001
177	16	7.38	0.22	9.8	Sea	20.80	88.7	11.27	0.02	1.09	1.61	1.50	1.10	0.08	0.00330	0.04334	0.00	-0.0021
177	19	6.83	0.19	8.5	Sea	21.80	1.7	9.78	0.43	1.38	3.83	3.35	1.86	1.38	0.00917	0.06896	12.87	0.0002
177	22	6.82	0.21	8.5	Sea	25.90	36.4	10.94	0.46	1.51	4.22	3.70	2.21	1.38	0.00917	0.08328	13.86	0.0015
178	1	7.30	0.22	7.5	Sea	10.20	27.2	10.66	0.02	1.08	1.65	1.53	0.65	0.28	0.00484	0.04264	0.00	-0.0022
178	4	7.27	0.20	8.5	Sea	11.40	76.4	9.89	0.02	0.92	1.44	1.38	0.68	0.19	0.00427	0.03108	0.00	-0.0032
178	7	6.74	0.16	8.5	Sea	26.50	41.4	8.28	0.37	1.36	3.46	2.89	2.08	0.92	0.00766	0.06733	10.95	0.0000
178	10	6.75	0.15	8.5	Sea	29.30	34.9	7.80	0.34	1.44	3.47	2.76	2.24	0.80	0.00719	0.07577	10.07	0.0008
178	13	7.37	0.22	7.5	Sea	12.10	32.4	10.31	0.02	1.10	1.66	1.51	0.74	0.22	0.00447	0.04408	0.00	-0.0021
178	16	7.48	0.24	8.5	Sea	14.50	89.0	11.97	0.02	1.04	1.62	1.59	0.85	0.16	0.00406	0.03955	0.00	-0.0025
178	19	6.95	0.20	8.5	Sea	17.10	35.0	10.23	0.02	1.22	1.77	1.51	0.98	0.14	0.00392	0.05372	0.00	-0.0012
178	22	6.66	0.12	8.5	Sea	29.00	61.0	6.32	0.02	1.26	1.71	1.17	1.41	0.04	0.00276	0.05735	0.00	-0.0009
179	1	7.11	0.19	7.5	Sea	14.80	49.1	9.30	0.02	1.07	1.59	1.41	0.85	0.14	0.00391	0.04138	0.00	-0.0023
179	4	7.29	0.20	9.8	Sea	10.70	43.3	10.31	0.02	1.02	1.53	1.41	0.67	0.25	0.00468	0.03756	0.00	-0.0026
179	7	6.86	0.15	8.5	Sea	19.20	1.3	8.08	0.02	1.19	1.69	1.32	1.05	0.10	0.00355	0.05142	0.00	-0.0014
179	10	6.59	0.10	8.5	Sea	42.10	6.6	5.30	0.21	1.77	3.48	2.06	2.80	0.37	0.00536	0.11408	6.30	0.0042
179	13	7.13	0.14	8.5	Sea	20.20	84.0	7.12	0.02	0.91	1.31	1.13	1.01	0.05	0.00290	0.03039	0.00	-0.0033
179	16	7.49	0.21	3.9	Bay	26.30	9.4	4.44	0.02	1.22	1.70	1.11	1.30	0.05	0.00283	0.05431	0.00	-0.0011
179	19	7.12	0.13	9.8	Sea	24.60	64.1	6.82	0.02	1.12	1.55	1.15	1.22	0.05	0.00288	0.04577	0.00	-0.0019
179	22	6.69	0.10	8.5	Sea	24.90	11.1	5.03	0.02	1.18	1.61	1.03	1.25	0.05	0.00292	0.05043	0.00	-0.0015
180	1	6.87	0.10	8.5	Sea	20.50	32.0	5.10	0.02	1.01	1.40	0.98	1.04	0.06	0.00301	0.03715	0.00	-0.0027
180	4	7.25	0.16	8.5	Sea	15.70	31.6	7.84	0.02	1.03	1.50	1.25	0.88	0.12	0.00369	0.03883	0.00	-0.0025
180	7	7.14	0.15	9.8	Sea	18.40	69.6	7.81	0.02	0.97	1.40	1.19	0.97	0.07	0.00323	0.03414	0.00	-0.0030
180	10	6.74	0.49	4.4	Bay	36.40	33.2	16.08	0.30	2.23	5.84	5.17	2.91	1.00	0.00793	0.18048	9.02	0.0102
180	13	7.03	0.18	7.5	Bay	16.40	36.5	8.79	0.02	1.11	1.63	1.39	0.92	0.12	0.00376	0.04502	0.00	-0.0020
180	16	7.66	0.22	4.4	Bay	24.20	86.1	6.10	0.02	1.00	1.43	1.20	1.16	0.04	0.00268	0.03628	0.00	-0.0028
180	19	7.56	0.22	5.6	Bay	40.10	11.9	8.36	0.21	1.91	4.06	2.96	2.79	0.48	0.00589	0.13237	6.31	0.0059
180	22	6.90	0.26	4.7	Bay	24.10	70.4	9.08	0.02	1.24	1.83	1.57	1.25	0.07	0.00314	0.05605	0.00	-0.0010
181	1	6.84	0.18	4.1	Bay	21.80	24.4	5.07	0.02	1.10	1.57	1.14	1.10	0.06	0.00300	0.04403	0.00	-0.0021
181	4	7.35	0.17	5.6	Bay	12.40	88.0	6.83	0.02	0.74	1.19	1.15	0.67	0.10	0.00347	0.01984	0.00	-0.0042
181	7	7.35	0.15	8.5	Sea	11.50	22.9	7.47	0.02	0.90	1.34	1.17	0.67	0.16	0.00406	0.02950	0.00	-0.0034
181	10	6.81	0.20	3.9	Bay	24.90	87.9	4.90	0.02	0.97	1.35	1.08	1.17	0.03	0.00254	0.03389	0.00	-0.0030
181	13	6.81	0.14	42.7	Sea	21.80	4.4	8.47	0.02	1.20	1.61	1.10	1.18	0.09	0.00346	0.05257	0.00	-0.0013
181	16	7.47	0.17	6.7	Sea	26.90	17.3	7.79	0.27	1.42	3.38	2.74	2.01	0.70	0.00684	0.07341	8.00	0.0006
181	19	7.60	0.19	4.1	Bay	31.80	82.4	4.60	0.02	1.20	1.61	1.10	1.47	0.03	0.00246	0.05212	0.00	-0.0013
181	22	6.99	0.15	6.1	Sea	27.30	82.6	6.71	0.02	1.12	1.56	1.23	1.31	0.04	0.00266	0.04559	0.00	-0.0019

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8907

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day Jln	time hour	depth m	H cm	T sec	srce --	Uc cm/s	Phi deg	Ub cm/s	Zo cm	u*s cm/s	u*t cm/s	u*wm cm/s	u*c cm/s	Z'o cm	Cd --	Shlds ---	Kbr cm	C* cm
182	1	6.70	0.09	7.5	Bay	33.00	0.8	4.37	0.17	1.41	2.73	1.71	2.13	0.31	0.00503	0.07280	5.02	0.0005
182	4	7.14	0.14	5.1	Bay	17.90	41.8	5.27	0.02	0.94	1.37	1.07	0.92	0.06	0.00311	0.03243	0.00	-0.0031
182	7	7.38	0.19	6.7	Sea	14.90	89.5	8.53	0.02	0.86	1.35	1.30	0.81	0.10	0.00347	0.02703	0.00	-0.0036
182	10	6.91	0.18	7.5	Sea	23.80	25.3	9.00	0.35	1.37	3.61	3.10	1.91	1.03	0.00802	0.06871	10.46	0.0002
182	13	6.67	0.12	5.6	Bay	32.30	6.6	5.20	0.15	1.45	2.85	1.95	2.08	0.30	0.00497	0.07699	4.37	0.0009
182	16	7.24	0.18	5.6	Bay	15.60	25.6	7.13	0.02	1.03	1.52	1.28	0.86	0.11	0.00359	0.03838	0.00	-0.0026
182	19	7.62	0.17	5.6	Bay	20.50	65.3	6.37	0.02	1.00	1.45	1.19	1.04	0.06	0.00301	0.03660	0.00	-0.0027
182	22	7.21	0.14	6.1	Sea	39.90	79.4	6.15	0.19	1.51	2.95	2.21	2.52	0.27	0.00480	0.08329	5.57	0.0015
183	1	6.65	0.13	6.7	Sea	27.70	31.1	6.42	0.02	1.34	1.85	1.26	1.40	0.05	0.00296	0.06486	0.00	-0.0002
183	4	6.97	0.19	5.6	Bay	19.30	85.6	7.92	0.02	0.95	1.44	1.32	0.99	0.06	0.00309	0.03300	0.00	-0.0031
183	7	7.41	0.25	5.1	Bay	13.00	35.4	8.77	0.02	1.06	1.62	1.47	0.76	0.16	0.00404	0.04065	0.00	-0.0024
183	10	7.10	0.22	7.5	Sea	18.10	36.0	10.58	0.02	1.27	1.86	1.60	1.04	0.14	0.00388	0.05912	0.00	-0.0007
183	13	6.63	0.14	7.5	Sea	31.80	33.9	7.11	0.27	1.49	3.36	2.55	2.30	0.59	0.00637	0.08129	7.99	0.0013
183	16	6.99	0.21	6.7	Bay	18.50	64.0	9.74	0.02	1.14	1.69	1.50	1.02	0.10	0.00357	0.04725	0.00	-0.0018
183	19	7.54	0.28	5.6	Bay	14.40	38.7	10.83	0.02	1.22	1.85	1.68	0.86	0.18	0.00422	0.05392	0.00	-0.0012
183	22	7.34	0.18	6.7	Sea	39.70	82.7	8.16	0.27	1.54	3.39	2.81	2.72	0.43	0.00569	0.08681	8.11	0.0018
184	1	6.65	0.19	8.5	Sea	28.70	1.9	10.05	0.42	1.61	4.19	3.45	2.37	1.17	0.00851	0.09474	12.41	0.0025
184	4	6.72	0.16	6.7	Sea	26.20	60.5	7.77	0.02	1.26	1.77	1.36	1.32	0.05	0.00298	0.05744	0.00	-0.0009
184	7	7.30	0.22	7.5	Sea	14.50	19.0	10.33	0.02	1.19	1.76	1.54	0.86	0.18	0.00423	0.05140	0.00	-0.0014
184	10	7.20	0.19	6.7	Sea	14.40	18.8	8.75	0.02	1.09	1.62	1.40	0.83	0.15	0.00397	0.04348	0.00	-0.0021
184	13	6.64	0.16	7.5	Bay	29.30	67.2	8.18	0.02	1.33	1.84	1.40	1.45	0.05	0.00287	0.06401	0.00	-0.0003
184	16	6.75	0.18	6.1	Sea	28.80	50.2	8.36	0.26	1.42	3.42	2.89	2.11	0.63	0.00657	0.07369	7.76	0.0006
184	19	7.41	0.26	6.1	Sea	15.40	5.5	10.75	0.02	1.28	1.90	1.67	0.91	0.18	0.00419	0.05922	0.00	-0.0007
184	22	7.42	0.16	8.5	Sea	23.80	90.0	8.02	0.02	1.01	1.43	1.24	1.16	0.04	0.00278	0.03708	0.00	-0.0027
185	1	6.81	0.15	7.5	Sea	26.90	27.9	7.53	0.29	1.38	3.30	2.66	2.02	0.73	0.00696	0.06901	8.75	0.0002
185	4	6.66	0.12	7.5	Bay	26.30	26.0	6.27	0.02	1.29	1.78	1.21	1.33	0.06	0.00300	0.06016	0.00	-0.0006
185	7	7.26	0.21	6.7	Sea	21.40	15.6	9.46	0.02	1.36	1.95	1.56	1.18	0.11	0.00359	0.06680	0.00	-0.0000
185	10	7.41	0.17	6.7	Sea	17.50	88.1	7.43	0.02	0.86	1.29	1.19	0.90	0.06	0.00309	0.02668	0.00	-0.0036
185	13	6.87	0.17	8.5	Sea	17.60	24.8	8.59	0.02	1.15	1.66	1.35	0.98	0.12	0.00369	0.04808	0.00	-0.0017
185	16	6.73	0.21	6.1	Sea	25.10	32.0	9.43	0.29	1.44	3.70	3.22	1.95	0.86	0.00745	0.07560	8.71	0.0008
185	19	7.36	0.27	8.5	Sea	18.20	13.6	13.39	0.57	1.48	4.75	4.43	1.74	2.30	0.01182	0.07994	17.11	0.0012
185	22	7.65	0.28	8.5	Sea	33.30	72.4	13.39	0.55	1.64	4.81	4.41	2.84	1.38	0.00917	0.09832	16.42	0.0028
186	1	7.12	0.24	9.8	Sea	17.90	70.2	12.79	0.02	1.23	1.83	1.68	1.03	0.15	0.00396	0.05533	0.00	-0.0010
186	4	6.73	0.24	7.5	Sea	29.70	47.0	11.95	0.43	1.65	4.54	3.99	2.47	1.23	0.00870	0.09916	12.91	0.0029
186	7	7.11	0.27	6.7	Sea	21.90	58.0	12.44	0.43	1.42	4.37	4.12	1.89	1.47	0.00943	0.07297	12.79	0.0005
186	10	7.46	0.34	7.5	Sea	13.40	18.9	15.82	0.59	1.51	5.31	5.14	1.36	2.93	0.01350	0.08283	17.72	0.0014
186	13	7.05	0.22	9.8	Sea	13.50	9.0	11.53	0.02	1.22	1.79	1.58	0.84	0.23	0.00459	0.05388	0.00	-0.0012
186	16	6.67	0.20	8.5	Sea	30.20	46.7	10.35	0.43	1.57	4.14	3.53	2.47	1.12	0.00832	0.08945	12.93	0.0020
186	19	7.14	0.30	6.1	Sea	18.70	77.9	13.22	0.02	1.29	1.98	1.88	1.07	0.14	0.00389	0.06076	0.00	-0.0006
186	22	7.53	0.41	6.1	Sea	11.90	12.6	17.18	0.51	1.60	5.65	5.53	1.19	2.78	0.01311	0.09291	15.23	0.0023
187	1	7.17	0.25	8.5	Sea	11.50	3.8	12.56	0.02	1.24	1.86	1.71	0.74	0.31	0.00503	0.05624	0.00	-0.0010
187	4	6.66	0.16	7.5	Sea	28.80	29.0	8.06	0.31	1.47	3.52	2.83	2.18	0.76	0.00707	0.07827	9.13	0.0010
187	7	6.92	0.20	6.1	Sea	25.70	74.3	8.68	0.02	1.22	1.74	1.45	1.30	0.05	0.00298	0.05392	0.00	-0.0012
187	10	7.39	0.25	6.1	Sea	11.70	29.3	10.60	0.02	1.14	1.75	1.61	0.72	0.23	0.00454	0.04724	0.00	-0.0018
187	13	7.18	0.23	7.5	Sea	9.80	59.8	10.98	0.02	1.03	1.61	1.54	0.62	0.28	0.00485	0.03887	0.00	-0.0025
187	16	6.72	0.16	6.7	Sea	15.30	34.4	7.77	0.02	1.03	1.52	1.29	0.86	0.12	0.00369	0.03856	0.00	-0.0026
187	19	6.93	0.23	6.7	Sea	10.10	78.9	10.70	0.02	0.98	1.57	1.53	0.63	0.24	0.00462	0.03499	0.00	-0.0029
187	22	7.39	0.29	5.1	Bay	14.40	36.8	10.22	0.02	1.19	1.82	1.65	0.85	0.17	0.00412	0.05158	0.00	-0.0014
188	1	7.19	0.22	11.6	Sea	19.00	83.2	12.03	0.02	1.12	1.65	1.53	1.05	0.11	0.00359	0.04544	0.00	-0.0019
188	4	6.66	0.15	11.6	Sea	27.40	12.5	8.49	0.50	1.45	3.77	3.00	2.30	1.28	0.00885	0.07646	14.94	0.0009

188	7	6.80	0.15	6.1	Sea	20.30	68.6	6.86	0.02	1.00	1.46	1.22	1.04	0.06	0.00305	0.03670	0.00	-0.0027
188	10	7.33	0.19	6.7	Sea	11.70	6.3	8.44	0.02	1.00	1.51	1.35	0.70	0.18	0.00422	0.03664	0.00	-0.0027
188	13	7.27	0.18	6.7	Sea	13.50	74.2	8.13	0.02	0.88	1.36	1.27	0.75	0.12	0.00368	0.02834	0.00	-0.0035
188	16	6.76	0.16	6.7	Sea	17.60	32.5	7.78	0.02	1.10	1.60	1.32	0.96	0.10	0.00354	0.04415	0.00	-0.0021
188	19	6.79	0.12	6.1	Sea	15.10	56.0	5.47	0.02	0.83	1.22	1.02	0.79	0.07	0.00322	0.02482	0.00	-0.0038
188	22	7.24	0.18	5.6	Bay	17.50	4.5	7.01	0.02	1.10	1.60	1.29	0.95	0.10	0.00349	0.04375	0.00	-0.0021
189	1	7.26	0.14	6.7	Sea	22.00	70.7	6.41	0.02	1.01	1.44	1.15	1.10	0.05	0.00290	0.03730	0.00	-0.0027
189	4	6.76	0.11	11.6	Sea	18.90	20.2	6.34	0.02	1.04	1.45	1.06	1.00	0.08	0.00329	0.03924	0.00	-0.0025
189	7	6.72	0.09	9.8	Sea	27.60	33.4	4.71	0.02	1.21	1.63	0.98	1.35	0.04	0.00277	0.05329	0.00	-0.0012
189	10	7.21	0.15	5.6	Bay	9.30	27.8	5.88	0.02	0.76	1.18	1.06	0.54	0.15	0.00394	0.02084	0.00	-0.0042
189	13	7.33	0.14	6.7	Sea	12.90	82.2	6.32	0.02	0.72	1.12	1.05	0.69	0.08	0.00335	0.01907	0.00	-0.0043
189	16	6.99	0.18	3.9	Bay	20.00	65.9	4.40	0.02	0.89	1.29	1.01	0.98	0.04	0.00279	0.02906	0.00	-0.0034
189	19	6.88	0.25	3.9	Bay	17.00	37.3	6.18	0.02	1.01	1.51	1.26	0.90	0.08	0.00331	0.03703	0.00	-0.0027
189	22	7.35	0.18	3.9	Bay	18.20	76.2	3.90	0.02	0.78	1.12	0.91	0.88	0.04	0.00271	0.02187	0.00	-0.0041
190	1	7.35	0.15	5.6	Bay	20.60	18.1	6.00	0.02	1.12	1.59	1.19	1.07	0.07	0.00318	0.04531	0.00	-0.0020
190	4	6.95	0.13	8.5	Sea	17.80	57.3	6.51	0.02	0.94	1.35	1.10	0.93	0.07	0.00320	0.03220	0.00	-0.0031
190	7	6.75	0.12	7.5	Sea	19.10	20.8	6.16	0.02	1.06	1.50	1.13	1.01	0.08	0.00326	0.04065	0.00	-0.0024
190	10	7.14	0.11	6.1	Sea	9.90	25.9	4.72	0.02	0.69	1.04	0.90	0.55	0.11	0.00362	0.01712	0.00	-0.0045
190	13	7.42	0.14	9.8	Sea	19.80	59.2	7.32	0.02	1.03	1.46	1.17	1.03	0.07	0.00318	0.03837	0.00	-0.0026
190	16	7.10	0.12	14.2	Sea	16.70	29.2	6.44	0.02	0.95	1.33	1.01	0.90	0.09	0.00340	0.03285	0.00	-0.0031
190	19	6.79	0.12	7.5	Sea	24.80	15.0	6.14	0.02	1.25	1.73	1.18	1.27	0.06	0.00305	0.05645	0.00	-0.0009
190	22	7.01	0.13	7.5	Sea	13.30	72.9	6.40	0.02	0.77	1.16	1.05	0.71	0.09	0.00339	0.02134	0.00	-0.0041
191	1	7.24	0.14	8.5	Sea	11.70	25.6	6.89	0.02	0.86	1.28	1.11	0.67	0.14	0.00392	0.02721	0.00	-0.0036
191	4	6.96	0.13	9.8	Sea	15.60	18.3	7.02	0.02	0.99	1.42	1.13	0.86	0.11	0.00361	0.03555	0.00	-0.0028
191	7	6.65	0.09	9.8	Sea	25.30	28.7	4.90	0.02	1.15	1.57	0.98	1.25	0.05	0.00286	0.04850	0.00	-0.0017
191	10	6.92	0.11	9.8	Sea	20.50	76.7	5.91	0.02	0.90	1.25	1.00	1.01	0.04	0.00281	0.02937	0.00	-0.0034
191	13	7.30	0.17	8.5	Sea	9.80	83.8	8.51	0.02	0.79	1.25	1.22	0.58	0.18	0.00421	0.02251	0.00	-0.0040
191	16	7.11	0.18	3.9	Bay	15.60	66.8	4.24	0.02	0.75	1.13	0.95	0.78	0.05	0.00293	0.02067	0.00	-0.0042
191	19	6.71	0.13	8.5	Sea	10.20	24.4	6.77	0.02	0.82	1.22	1.08	0.60	0.16	0.00408	0.02416	0.00	-0.0039
191	22	6.80	0.18	8.5	Sea	10.70	54.4	9.28	0.02	0.94	1.44	1.34	0.65	0.21	0.00440	0.03209	0.00	-0.0031
192	1	7.09	0.16	8.5	Sea	16.30	32.0	8.16	0.02	1.07	1.55	1.29	0.91	0.12	0.00369	0.04165	0.00	-0.0023
192	4	7.00	0.14	8.5	Sea	11.60	64.0	7.25	0.02	0.80	1.22	1.12	0.66	0.13	0.00381	0.02339	0.00	-0.0039
192	7	6.67	0.12	9.8	Sea	15.90	9.0	6.82	0.02	0.99	1.42	1.12	0.88	0.10	0.00357	0.03586	0.00	-0.0028
192	10	6.83	0.10	8.5	Sea	21.20	65.3	4.97	0.02	0.93	1.29	0.94	1.04	0.04	0.00278	0.03144	0.00	-0.0032
192	13	7.20	0.16	8.5	Sea	10.10	1.6	8.08	0.02	0.91	1.37	1.23	0.61	0.21	0.00440	0.03032	0.00	-0.0033
192	16	7.21	0.16	8.5	Sea	16.80	89.2	8.28	0.02	0.86	1.30	1.22	0.88	0.07	0.00323	0.02710	0.00	-0.0036
192	19	6.82	0.15	9.8	Sea	11.70	36.9	8.03	0.02	0.91	1.35	1.19	0.69	0.17	0.00411	0.03009	0.00	-0.0033
192	22	6.82	0.11	8.5	Sea	9.60	51.7	5.91	0.02	0.70	1.07	0.96	0.55	0.14	0.00386	0.01776	0.00	-0.0044
193	1	7.11	0.13	8.5	Sea	12.70	35.2	6.57	0.02	0.86	1.26	1.08	0.71	0.12	0.00371	0.02676	0.00	-0.0036
193	4	7.12	0.24	4.1	Bay	19.50	9.5	6.28	0.02	1.13	1.65	1.29	1.03	0.08	0.00327	0.04638	0.00	-0.0019
193	7	6.87	0.17	9.8	Sea	21.10	31.3	9.13	0.02	1.26	1.79	1.41	1.15	0.10	0.00352	0.05809	0.00	-0.0008
193	10	6.85	0.17	9.8	Sea	19.90	0.7	9.20	0.02	1.27	1.80	1.42	1.11	0.11	0.00367	0.05864	0.00	-0.0008
193	13	7.31	0.22	9.8	Sea	9.90	18.9	11.65	0.02	1.12	1.68	1.55	0.65	0.33	0.00517	0.04532	0.00	-0.0020
193	16	7.47	0.18	11.6	Sea	30.40	62.8	9.81	0.58	1.44	3.93	3.37	2.56	1.30	0.00890	0.07509	17.31	0.0007
193	19	7.15	0.18	9.8	Sea	29.70	75.2	9.59	0.02	1.34	1.85	1.46	1.48	0.05	0.00288	0.06484	0.00	-0.0002
193	22	6.89	0.20	8.5	Sea	8.90	5.8	10.45	0.02	1.04	1.58	1.47	0.58	0.32	0.00510	0.03901	0.00	-0.0025
194	1	7.05	0.19	8.5	Sea	4.80	36.6	9.78	0.02	0.88	1.39	1.36	0.34	0.52	0.00606	0.02799	0.00	-0.0035
194	4	7.22	0.18	8.5	Sea	9.20	70.4	8.87	0.02	0.84	1.32	1.27	0.56	0.22	0.00450	0.02579	0.00	-0.0037
194	7	6.95	0.18	9.8	Sea	31.50	11.1	9.81	0.46	1.67	4.28	3.41	2.61	1.20	0.00860	0.10184	13.79	0.0031
194	10	6.78	0.13	9.8	Sea	15.50	29.9	7.24	0.02	0.98	1.41	1.15	0.86	0.11	0.00362	0.03510	0.00	-0.0029
194	13	7.08	0.16	8.5	Sea	15.90	80.3	8.07	0.02	0.88	1.32	1.21	0.85	0.09	0.00337	0.02822	0.00	-0.0035
194	16	7.42	0.19	8.5	Sea	13.80	4.9	9.51	0.02	1.11	1.64	1.42	0.82	0.18	0.00420	0.04511	0.00	-0.0020
194	19	7.21	0.22	5.1	Bay	19.50	31.1	8.22	0.02	1.21	1.78	1.46	1.06	0.10	0.00349	0.05351	0.00	-0.0012
194	22	6.86	0.14	9.8	Sea	22.60	5.9	7.35	0.02	1.24	1.73	1.25	1.20	0.08	0.00329	0.05604	0.00	-0.0010
195	1	7.01	0.19	3.5	Bay	14.70	11.8	3.20	0.02	0.76	1.12	0.84	0.74	0.05	0.00298	0.02104	0.00	-0.0041
195	4	7.38	0.22	7.5	Bay	25.60	38.7	10.39	0.39	1.47	4.01	3.52	2.11	1.16	0.00847	0.07911	11.74	0.0011
195	7	7.23	0.35	4.1	Bay	11.00	79.8	9.23	0.02	0.95	1.58	1.54	0.65	0.17	0.00414	0.03298	0.00	-0.0031
195	10	6.88	0.38	4.4	Bay	21.30	69.0	11.89	0.27	1.36	4.08	3.93	1.68	0.95	0.00776	0.06728	8.13	0.0000
195	13	7.09	0.21	14.2	Sea	17.60	17.0	11.59	0.02	1.30	1.84	1.53	1.04	0.17	0.00417	0.06144	0.00	-0.0005
195	16	7.49	0.25	14.2	Sea	21.00	40.4	13.64	0.98	1.46	4.96	4.55	2.21	3.34	0.01455	0.07745	29.23	0.0009

195	19	7.42	0.28	14.2	Sea	22.40	77.6	15.46	1.13	1.38	5.26	5.08	2.40	3.59	0.01520	0.06969	33.84	0.0002
195	22	6.96	0.24	14.2	Sea	21.20	29.4	13.35	0.95	1.48	4.93	4.46	2.22	3.26	0.01435	0.08016	28.43	0.0012
196	1	6.94	0.19	14.2	Sea	13.00	20.9	10.65	0.02	1.10	1.59	1.39	0.80	0.23	0.00453	0.04418	0.00	-0.0021
196	4	7.29	0.21	11.6	Sea	9.90	78.6	11.40	0.02	0.95	1.47	1.43	0.63	0.28	0.00486	0.03314	0.00	-0.0030
196	7	7.26	0.22	11.6	Sea	25.00	36.4	12.07	0.70	1.52	4.61	4.06	2.35	2.13	0.01134	0.08438	20.82	0.0016
196	10	6.90	0.23	11.6	Sea	18.90	13.4	12.49	0.74	1.41	4.58	4.18	1.89	2.73	0.01296	0.07283	22.18	0.0005
196	13	6.94	0.18	9.8	Sea	19.50	51.6	9.71	0.02	1.18	1.70	1.42	1.07	0.10	0.00357	0.05104	0.00	-0.0014
196	16	7.42	0.25	9.8	Sea	9.60	25.2	13.08	0.02	1.19	1.80	1.69	0.65	0.40	0.00550	0.05178	0.00	-0.0014
196	19	7.50	0.28	11.6	Sea	15.40	87.3	14.65	0.02	1.18	1.79	1.74	0.93	0.20	0.00434	0.05073	0.00	-0.0015
196	22	7.05	0.23	11.6	Sea	18.80	82.8	12.72	0.02	1.15	1.70	1.60	1.05	0.12	0.00371	0.04839	0.00	-0.0017
197	1	6.83	0.23	9.8	Sea	12.30	24.2	12.52	0.02	1.23	1.82	1.66	0.79	0.28	0.00489	0.05498	0.00	-0.0011
197	4	7.15	0.33	9.8	Sea	6.90	44.4	17.55	0.89	1.39	5.75	5.71	0.83	5.33	0.01957	0.07035	26.56	0.0003
197	7	7.24	0.36	9.8	Sea	16.40	34.1	18.98	0.88	1.71	6.32	6.09	1.83	4.19	0.01670	0.10640	26.45	0.0035
197	10	6.88	0.28	11.6	Sea	13.70	85.3	15.79	0.02	1.24	1.88	1.85	0.87	0.27	0.00482	0.05579	0.00	-0.0010
197	13	6.70	0.28	9.8	Sea	16.50	42.3	15.41	0.76	1.48	5.26	5.04	1.72	3.25	0.01432	0.07920	22.77	0.0011
197	16	7.19	0.37	9.8	Sea	16.90	54.5	19.38	0.91	1.67	6.38	6.21	1.89	4.20	0.01673	0.10204	27.23	0.0032
197	19	7.63	0.39	9.8	Sea	5.30	4.1	19.49	0.95	1.50	6.31	6.27	0.67	6.32	0.02205	0.08226	28.60	0.0014
197	22	7.23	0.40	3.9	Bay	9.40	69.9	8.88	0.02	0.94	1.57	1.52	0.57	0.20	0.00434	0.03228	0.00	-0.0031
198	1	6.79	0.27	9.8	Sea	43.40	35.3	14.63	0.61	2.26	6.04	4.87	3.80	1.55	0.00969	0.18513	18.25	0.0106
198	4	7.15	0.31	6.1	Bay	56.70	24.6	13.51	0.19	2.72	5.54	3.98	3.94	0.47	0.00587	0.26885	4.64	0.0182
198	7	7.41	0.30	8.5	Sea	16.90	40.0	14.67	0.63	1.47	5.04	4.81	1.68	2.66	0.01278	0.07841	18.82	0.0010
198	10	7.19	0.25	9.8	Sea	15.80	31.7	13.13	0.02	1.35	1.97	1.75	0.97	0.22	0.00449	0.06621	0.00	-0.0001
198	13	6.86	0.21	9.8	Sea	21.10	55.3	11.30	0.02	1.30	1.87	1.59	1.17	0.11	0.00364	0.06172	0.00	-0.0005
198	16	7.17	0.19	5.1	Bay	8.50	88.6	6.90	0.02	0.70	1.18	1.17	0.50	0.16	0.00405	0.01784	0.00	-0.0044
198	19	7.67	0.28	5.1	Bay	36.30	30.4	9.64	0.23	1.83	4.14	3.31	2.61	0.57	0.00630	0.12132	6.80	0.0049
198	22	7.45	0.23	6.7	Bay	46.70	51.1	10.30	0.30	2.08	4.67	3.55	3.40	0.61	0.00648	0.15701	9.09	0.0081
199	1	6.92	0.28	9.8	Sea	18.00	20.7	14.89	0.72	1.54	5.20	4.89	1.84	3.00	0.01366	0.08627	21.64	0.0017
199	4	7.07	0.26	7.5	Sea	12.40	64.7	12.77	0.02	1.18	1.82	1.74	0.78	0.25	0.00468	0.05089	0.00	-0.0014
199	7	7.55	0.29	6.7	Bay	11.80	5.8	12.75	0.02	1.29	1.96	1.81	0.76	0.29	0.00494	0.06091	0.00	-0.0005
199	10	7.35	0.34	8.5	Sea	11.60	80.4	16.94	0.75	1.36	5.55	5.52	1.26	3.75	0.01560	0.06734	22.40	0.0000
199	13	6.85	0.23	3.9	Bay	24.10	41.1	5.66	0.02	1.18	1.68	1.25	1.21	0.05	0.00295	0.05058	0.00	-0.0015
199	16	7.05	0.22	5.6	Bay	25.30	65.8	9.14	0.02	1.29	1.86	1.55	1.31	0.07	0.00312	0.06059	0.00	-0.0006
199	19	7.66	0.31	5.6	Bay	17.30	1.5	11.68	0.33	1.41	4.16	3.89	1.47	1.36	0.00911	0.07186	9.96	0.0004
199	22	7.55	0.23	6.1	Sea	25.90	85.2	9.66	0.02	1.20	1.74	1.53	1.30	0.05	0.00295	0.05196	0.00	-0.0014
200	1	6.92	0.19	7.5	Sea	19.10	16.0	9.24	0.02	1.26	1.81	1.48	1.07	0.12	0.00370	0.05770	0.00	-0.0008
200	4	6.90	0.15	5.6	Bay	23.30	46.5	6.46	0.02	1.16	1.65	1.25	1.19	0.06	0.00303	0.04935	0.00	-0.0016
200	7	7.44	0.26	5.1	Bay	19.60	8.4	9.19	0.02	1.31	1.93	1.59	1.09	0.11	0.00366	0.06286	0.00	-0.0004
200	10	7.45	0.26	5.6	Bay	16.80	88.8	9.88	0.02	1.00	1.57	1.52	0.92	0.10	0.00352	0.03635	0.00	-0.0028
200	13	6.85	0.19	8.5	Sea	18.80	11.6	9.86	0.02	1.28	1.84	1.51	1.07	0.13	0.00382	0.05992	0.00	-0.0006
200	16	6.81	0.23	4.1	Bay	22.40	54.2	6.61	0.02	1.14	1.65	1.33	1.14	0.06	0.00305	0.04717	0.00	-0.0018
200	19	7.44	0.29	6.1	Bay	25.00	26.6	12.22	0.36	1.63	4.52	4.06	2.08	1.23	0.00869	0.09633	10.75	0.0026
200	22	7.52	0.22	7.5	Sea	33.90	57.6	10.34	0.38	1.63	4.13	3.51	2.64	0.88	0.00751	0.09670	11.23	0.0027
201	1	6.89	0.17	7.5	Sea	23.50	63.5	8.37	0.02	1.19	1.69	1.37	1.21	0.06	0.00311	0.05127	0.00	-0.0014
201	4	6.66	0.13	8.5	Sea	24.50	31.4	6.69	0.02	1.24	1.71	1.21	1.26	0.06	0.00308	0.05549	0.00	-0.0010
201	7	7.18	0.23	7.5	Bay	19.60	53.0	11.13	0.02	1.29	1.89	1.64	1.10	0.12	0.00374	0.06052	0.00	-0.0006
201	10	7.47	0.26	5.1	Bay	13.30	35.5	9.04	0.02	1.08	1.66	1.50	0.78	0.16	0.00406	0.04274	0.00	-0.0022
201	13	6.95	0.18	9.8	Sea	15.70	28.9	9.81	0.02	1.15	1.67	1.42	0.91	0.16	0.00402	0.04805	0.00	-0.0017
201	16	6.69	0.22	8.5	Sea	30.80	21.1	11.44	0.46	1.74	4.63	3.87	2.60	1.31	0.00895	0.11025	13.71	0.0039
201	19	7.26	0.27	6.1	Sea	14.90	58.4	11.71	0.02	1.22	1.86	1.73	0.89	0.18	0.00421	0.05372	0.00	-0.0012
201	22	7.61	0.33	5.6	Bay	14.00	52.3	12.41	0.02	1.27	1.97	1.84	0.85	0.21	0.00444	0.05912	0.00	-0.0007
202	1	7.11	0.23	8.5	Sea	14.60	64.9	11.51	0.02	1.13	1.70	1.58	0.87	0.18	0.00418	0.04642	0.00	-0.0019
202	4	6.66	0.12	9.8	Sea	27.00	31.6	6.44	0.02	1.29	1.77	1.18	1.36	0.05	0.00297	0.06078	0.00	-0.0006
202	7	7.10	0.23	8.5	Sea	22.00	76.9	11.78	0.02	1.24	1.82	1.64	1.19	0.09	0.00344	0.05606	0.00	-0.0010
202	10	7.55	0.34	6.1	Sea	17.30	31.4	14.12	0.43	1.51	4.85	4.62	1.58	1.86	0.01058	0.08347	12.80	0.0015
202	13	7.18	0.22	5.6	Bay	12.20	69.1	8.67	0.02	0.93	1.47	1.39	0.71	0.15	0.00397	0.03153	0.00	-0.0032
202	16	6.70	0.14	8.5	Sea	17.10	9.6	7.20	0.02	1.06	1.52	1.20	0.94	0.10	0.00355	0.04117	0.00	-0.0023
202	19	7.06	0.25	6.7	Sea	19.20	70.0	11.44	0.02	1.23	1.84	1.68	1.07	0.12	0.00368	0.05477	0.00	-0.0011
202	22	7.64	0.24	5.6	Bay	17.80	12.8	9.26	0.02	1.25	1.85	1.55	1.01	0.13	0.00378	0.05710	0.00	-0.0009
203	1	7.34	0.17	9.8	Sea	25.90	67.5	8.66	0.02	1.23	1.72	1.35	1.31	0.06	0.00300	0.05519	0.00	-0.0011
203	4	6.76	0.12	8.5	Sea	24.00	4.3	6.53	0.02	1.24	1.73	1.20	1.24	0.07	0.00314	0.05635	0.00	-0.0010

203	7	6.99	0.16	7.5	Bay	24.60	38.2	7.69	0.02	1.29	1.80	1.34	1.28	0.07	0.00316	0.06018	0.00	-0.0006
203	10	7.62	0.23	6.7	Sea	17.40	13.2	9.99	0.02	1.27	1.86	1.57	1.00	0.14	0.00392	0.05863	0.00	-0.0008
203	13	7.41	0.25	8.5	Sea	12.30	83.4	12.34	0.02	1.07	1.66	1.63	0.76	0.22	0.00451	0.04131	0.00	-0.0023
203	16	6.78	0.15	18.3	Sea	16.50	5.8	9.00	0.02	1.11	1.55	1.22	0.95	0.14	0.00390	0.04446	0.00	-0.0020
203	19	6.89	0.19	7.5	Bay	22.40	42.3	9.26	0.02	1.30	1.86	1.49	1.21	0.09	0.00342	0.06139	0.00	-0.0005
203	22	7.48	0.23	18.3	Sea	22.20	27.2	12.54	1.16	1.45	4.83	4.25	2.39	3.65	0.01533	0.07681	34.64	0.0009
204	1	7.41	0.20	8.5	Sea	12.40	28.0	9.86	0.02	1.07	1.60	1.43	0.75	0.20	0.00438	0.04199	0.00	-0.0023
204	4	6.77	0.12	18.3	Sea	18.00	4.9	6.79	0.02	1.03	1.41	1.03	0.97	0.09	0.00344	0.03825	0.00	-0.0026
204	7	6.82	0.13	18.3	Sea	31.20	47.2	7.46	0.70	1.41	3.63	2.71	2.66	1.37	0.00912	0.07189	20.88	0.0004
204	10	7.45	0.22	14.2	Sea	17.80	46.4	12.10	0.02	1.26	1.80	1.55	1.04	0.16	0.00407	0.05787	0.00	-0.0008
204	13	7.51	0.24	18.3	Sea	15.30	50.0	13.35	0.02	1.23	1.76	1.56	0.94	0.22	0.00452	0.05484	0.00	-0.0011
204	16	6.90	0.19	18.3	Sea	18.80	39.2	10.83	0.02	1.22	1.71	1.39	1.07	0.14	0.00385	0.05437	0.00	-0.0011
204	19	6.77	0.12	14.2	Sea	25.00	2.4	6.95	0.02	1.28	1.74	1.16	1.30	0.07	0.00315	0.05926	0.00	-0.0007
204	22	7.29	0.22	14.2	Sea	23.00	75.7	11.97	0.02	1.24	1.75	1.53	1.23	0.08	0.00336	0.05555	0.00	-0.0010
205	1	7.48	0.21	14.2	Sea	16.30	48.7	11.64	0.02	1.19	1.71	1.49	0.96	0.17	0.00414	0.05122	0.00	-0.0014
205	4	6.93	0.20	14.2	Sea	21.30	47.6	11.06	0.02	1.30	1.82	1.49	1.18	0.11	0.00364	0.06120	0.00	-0.0005
205	7	6.74	0.14	14.2	Sea	27.50	20.9	7.77	0.57	1.39	3.61	2.79	2.33	1.35	0.00906	0.07009	17.00	0.0003
205	14	7.40	0.19	14.2	Sea	46.80	80.6	10.34	0.68	1.82	4.53	3.57	3.76	1.03	0.00804	0.12085	20.27	0.0048
205	17	6.84	0.18	18.3	Sea	17.60	43.9	10.30	0.02	1.14	1.61	1.33	1.00	0.13	0.00384	0.04756	0.00	-0.0017
205	20	6.72	0.18	14.2	Sea	21.80	59.3	10.44	0.02	1.22	1.72	1.41	1.18	0.09	0.00344	0.05456	0.00	-0.0011
205	23	7.26	0.22	14.2	Sea	14.40	6.7	11.94	0.02	1.23	1.77	1.53	0.89	0.24	0.00459	0.05524	0.00	-0.0011
206	2	7.30	0.21	14.2	Sea	18.30	71.7	11.41	0.02	1.12	1.62	1.44	1.02	0.12	0.00369	0.04562	0.00	-0.0019
206	5	6.82	0.18	14.2	Sea	21.40	7.6	10.47	0.77	1.36	4.15	3.60	2.07	2.41	0.01211	0.06750	23.07	0.0000
206	8	6.69	0.12	14.2	Sea	35.20	82.2	6.71	0.02	1.34	1.77	1.15	1.63	0.03	0.00249	0.06517	0.00	-0.0002
206	11	7.27	0.21	14.2	Sea	12.10	20.8	11.88	0.02	1.15	1.67	1.49	0.77	0.28	0.00489	0.04806	0.00	-0.0017
206	14	7.51	0.22	14.2	Sea	17.20	76.5	11.88	0.02	1.09	1.60	1.47	0.98	0.13	0.00381	0.04356	0.00	-0.0021
206	17	7.06	0.17	14.2	Sea	22.80	48.3	9.66	0.02	1.26	1.76	1.37	1.22	0.09	0.00338	0.05798	0.00	-0.0008
206	20	6.67	0.18	14.2	Sea	23.30	35.2	10.66	0.78	1.38	4.20	3.65	2.22	2.27	0.01174	0.06927	23.36	0.0002
206	23	6.99	0.21	11.6	Sea	16.70	70.5	11.40	0.02	1.11	1.63	1.49	0.95	0.14	0.00387	0.04472	0.00	-0.0020
207	2	7.28	0.26	7.5	Sea	11.40	45.9	12.60	0.02	1.21	1.84	1.73	0.73	0.29	0.00492	0.05286	0.00	-0.0013
207	5	6.94	0.22	7.5	Sea	19.50	43.7	10.95	0.02	1.31	1.91	1.64	1.10	0.13	0.00379	0.06269	0.00	-0.0004
207	8	6.59	0.17	7.5	Sea	31.60	44.5	8.58	0.32	1.53	3.68	2.99	2.38	0.75	0.00701	0.08552	9.55	0.0017
207	11	6.99	0.25	6.7	Sea	22.90	87.2	11.57	0.02	1.20	1.79	1.67	1.21	0.08	0.00327	0.05235	0.00	-0.0013
207	14	7.43	0.29	6.7	Sea	17.30	54.6	12.87	0.02	1.35	2.02	1.84	1.02	0.17	0.00415	0.06586	0.00	-0.0001
207	17	7.20	0.25	9.8	Sea	23.70	82.2	12.91	0.02	1.29	1.87	1.70	1.27	0.09	0.00338	0.06014	0.00	-0.0006
207	20	6.66	0.21	8.5	Sea	25.10	1.0	11.32	0.47	1.58	4.40	3.82	2.18	1.51	0.00957	0.09032	14.11	0.0021
207	23	6.79	0.21	7.5	Sea	25.00	88.8	10.52	0.02	1.17	1.70	1.54	1.27	0.06	0.00301	0.04968	0.00	-0.0016
208	2	7.18	0.27	7.5	Sea	15.60	82.4	13.21	0.02	1.19	1.83	1.77	0.92	0.18	0.00417	0.05114	0.00	-0.0014
208	5	7.02	0.19	8.5	Sea	10.80	6.4	9.76	0.02	1.04	1.56	1.41	0.67	0.24	0.00463	0.03952	0.00	-0.0025
208	8	6.59	0.13	9.8	Sea	19.40	56.4	7.36	0.02	1.03	1.46	1.17	1.02	0.07	0.00323	0.03855	0.00	-0.0026
208	11	6.73	0.15	6.7	Sea	22.50	89.4	7.33	0.02	0.96	1.39	1.22	1.10	0.04	0.00279	0.03376	0.00	-0.0030
208	14	7.29	0.25	7.5	Sea	22.00	16.6	11.92	0.45	1.52	4.41	3.98	1.93	1.58	0.00977	0.08355	13.32	0.0015
208	17	7.27	0.23	7.5	Sea	38.40	89.3	11.27	0.42	1.55	4.05	3.73	2.92	0.78	0.00713	0.08699	12.50	0.0018
208	20	6.72	0.15	14.2	Sea	30.50	54.8	8.71	0.63	1.42	3.78	3.06	2.59	1.34	0.00904	0.07343	18.87	0.0006
208	23	6.53	0.16	14.2	Sea	24.10	62.0	9.26	0.02	1.22	1.69	1.32	1.25	0.07	0.00316	0.05380	0.00	-0.0012
209	2	6.94	0.17	11.6	Sea	13.10	28.3	9.13	0.02	1.02	1.48	1.28	0.78	0.18	0.00419	0.03776	0.00	-0.0026
209	5	7.15	0.19	14.2	Sea	8.60	24.2	10.65	0.02	0.98	1.45	1.34	0.57	0.37	0.00535	0.03463	0.00	-0.0029
209	8	6.67	0.14	9.8	Sea	17.50	21.9	7.64	0.02	1.08	1.54	1.22	0.96	0.10	0.00357	0.04255	0.00	-0.0022
209	11	6.57	0.17	14.2	Sea	37.20	26.6	9.87	0.65	1.81	4.67	3.48	3.21	1.45	0.00938	0.11882	19.42	0.0047
209	14	7.09	0.21	8.5	Sea	16.10	84.1	10.56	0.02	1.01	1.54	1.46	0.90	0.12	0.00369	0.03701	0.00	-0.0027
209	17	7.36	0.20	7.5	Sea	18.70	72.5	9.65	0.02	1.09	1.61	1.45	1.01	0.09	0.00346	0.04285	0.00	-0.0022
209	20	6.99	0.18	8.5	Sea	27.90	28.1	9.06	0.39	1.49	3.81	3.14	2.24	1.03	0.00802	0.08091	11.55	0.0013
209	23	6.62	0.15	8.5	Sea	25.50	25.1	7.95	0.02	1.36	1.89	1.36	1.33	0.07	0.00321	0.06686	0.00	-0.0000
210	2	6.94	0.20	7.5	Sea	22.10	51.7	10.16	0.02	1.31	1.88	1.57	1.20	0.10	0.00348	0.06203	0.00	-0.0004
210	5	7.41	0.40	4.7	Bay	18.80	34.4	12.97	0.31	1.51	4.50	4.26	1.57	1.26	0.00880	0.08272	9.14	0.0014
210	8	7.16	0.43	5.1	Bay	13.80	36.9	15.97	0.40	1.56	5.29	5.16	1.28	2.04	0.01110	0.08882	12.00	0.0020
210	11	6.75	0.27	4.4	Bay	24.10	51.8	8.75	0.02	1.33	1.94	1.59	1.27	0.07	0.00324	0.06395	0.00	-0.0003
210	14	7.08	0.22	5.6	Bay	17.60	17.9	8.99	0.02	1.22	1.80	1.52	0.99	0.12	0.00375	0.05441	0.00	-0.0011
210	17	7.56	0.21	11.6	Sea	26.90	63.9	11.26	0.67	1.40	4.22	3.80	2.42	1.74	0.01025	0.07117	20.10	0.0004
210	20	7.35	0.16	7.5	Sea	45.10	72.1	7.66	0.27	1.77	3.70	2.72	3.07	0.42	0.00560	0.11406	8.05	0.0042

210	23	6.79	0.15	8.5	Sea	22.80	22.8	8.08	0.02	1.28	1.80	1.35	1.22	0.08	0.00334	0.05985	0.00	-0.0006
211	2	6.84	0.14	8.5	Sea	17.80	59.3	7.10	0.02	0.97	1.39	1.16	0.94	0.08	0.00327	0.03403	0.00	-0.0030
211	5	7.32	0.18	14.2	Sea	13.20	4.4	9.85	0.02	1.07	1.54	1.32	0.80	0.20	0.00438	0.04184	0.00	-0.0023
211	8	7.24	0.16	11.6	Sea	14.50	47.9	8.58	0.02	0.98	1.42	1.23	0.83	0.13	0.00384	0.03496	0.00	-0.0029
211	11	6.73	0.14	7.5	Sea	24.80	22.4	6.88	0.02	1.28	1.79	1.27	1.28	0.07	0.00312	0.05976	0.00	-0.0007
211	14	6.84	0.15	11.6	Sea	18.10	81.6	8.48	0.02	0.92	1.34	1.19	0.95	0.07	0.00320	0.03097	0.00	-0.0032
211	17	7.40	0.21	7.5	Bay	16.90	8.8	10.04	0.02	1.25	1.82	1.54	0.98	0.15	0.00398	0.05688	0.00	-0.0009
211	20	7.42	0.17	7.5	Sea	41.60	87.5	8.18	0.30	1.56	3.41	2.82	2.86	0.44	0.00573	0.08893	9.03	0.0020
211	23	6.84	0.19	7.5	Sea	26.90	32.0	9.51	0.36	1.48	3.84	3.26	2.15	1.00	0.00793	0.08020	10.72	0.0012
212	2	6.64	0.19	7.5	Sea	20.80	60.1	9.66	0.02	1.20	1.75	1.49	1.12	0.09	0.00343	0.05257	0.00	-0.0013
212	5	7.08	0.24	6.1	Sea	23.90	11.2	10.30	0.31	1.50	3.97	3.49	1.92	1.02	0.00801	0.08193	9.37	0.0013
212	8	7.32	0.23	7.5	Sea	14.20	24.4	10.88	0.02	1.21	1.80	1.60	0.86	0.20	0.00433	0.05312	0.00	-0.0012
212	11	6.88	0.13	8.5	Sea	19.00	37.4	6.87	0.02	1.06	1.50	1.17	1.01	0.08	0.00330	0.04076	0.00	-0.0024
212	14	6.77	0.11	11.6	Sea	36.90	75.3	6.34	0.38	1.43	3.13	2.31	2.64	0.56	0.00624	0.07409	11.22	0.0006
212	17	7.38	0.28	3.7	Bay	28.40	5.6	5.10	0.02	1.34	1.88	1.24	1.41	0.05	0.00287	0.06550	0.00	-0.0001
212	20	7.60	0.24	7.5	Sea	13.40	38.4	11.06	0.02	1.17	1.76	1.60	0.81	0.21	0.00440	0.04990	0.00	-0.0015
212	23	7.15	0.24	7.5	Bay	26.60	32.0	11.69	0.43	1.61	4.45	3.92	2.25	1.33	0.00902	0.09379	12.78	0.0024

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8908

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
213	2	6.77	0.21	3.5	Bay	20.70	62.4	3.71	0.02	0.89	1.27	0.94	1.00	0.04	0.00270	0.02901	0.00	-0.0034
213	5	7.16	0.25	8.5	Sea	18.60	24.4	12.62	0.55	1.43	4.52	4.20	1.74	2.11	0.01128	0.07439	16.36	0.0007
213	8	7.51	0.27	6.1	Sea	17.80	65.1	11.29	0.02	1.22	1.85	1.69	1.01	0.13	0.00382	0.05448	0.00	-0.0011
213	11	7.12	0.24	6.1	Sea	23.40	59.8	10.47	0.02	1.34	1.95	1.66	1.26	0.09	0.00339	0.06533	0.00	-0.0001
213	14	6.73	0.18	7.5	Sea	21.60	14.9	9.16	0.02	1.33	1.90	1.50	1.19	0.10	0.00355	0.06470	0.00	-0.0002
213	17	7.19	0.23	9.8	Sea	20.00	38.2	12.29	0.62	1.40	4.45	4.11	1.89	2.19	0.01152	0.07114	18.56	0.0004
213	20	7.65	0.26	7.5	Sea	24.80	57.4	11.84	0.45	1.45	4.29	3.95	2.12	1.38	0.00916	0.07636	13.47	0.0008
213	23	7.32	0.25	7.5	Sea	39.80	71.9	11.79	0.41	1.77	4.53	3.93	3.09	0.87	0.00748	0.11402	12.38	0.0042
214	2	6.79	0.19	7.5	Sea	26.40	5.9	9.46	0.35	1.51	3.88	3.26	2.12	1.03	0.00803	0.08319	10.58	0.0015
214	5	7.02	0.24	7.5	Sea	22.30	69.5	11.70	0.02	1.31	1.91	1.69	1.22	0.10	0.00350	0.06197	0.00	-0.0005
214	8	7.53	0.27	7.5	Sea	12.30	4.3	12.67	0.02	1.29	1.94	1.77	0.78	0.28	0.00489	0.06039	0.00	-0.0006
214	11	7.28	0.19	8.5	Sea	18.70	70.0	9.68	0.02	1.09	1.60	1.42	1.02	0.10	0.00348	0.04313	0.00	-0.0021
214	14	6.74	0.19	9.8	Sea	30.00	8.7	10.49	0.49	1.67	4.41	3.60	2.55	1.37	0.00912	0.10105	14.77	0.0031
214	17	6.99	0.21	8.5	Sea	22.80	80.6	10.61	0.02	1.17	1.71	1.52	1.19	0.07	0.00321	0.05003	0.00	-0.0015
214	20	7.54	0.28	9.8	Sea	13.60	10.6	14.54	0.73	1.40	4.99	4.79	1.43	3.38	0.01465	0.07174	21.92	0.0004
214	23	7.37	0.22	11.6	Sea	19.50	86.7	11.86	0.02	1.09	1.61	1.51	1.06	0.10	0.00348	0.04359	0.00	-0.0021
215	2	6.73	0.19	9.8	Sea	28.70	12.4	10.33	0.49	1.61	4.30	3.55	2.45	1.38	0.00917	0.09449	14.75	0.0025
215	5	6.81	0.14	9.8	Sea	24.80	58.0	7.55	0.02	1.19	1.65	1.24	1.26	0.06	0.00300	0.05171	0.00	-0.0014
215	8	7.35	0.21	9.8	Sea	17.40	55.5	11.04	0.02	1.19	1.74	1.53	1.00	0.14	0.00389	0.05149	0.00	-0.0014
215	11	7.27	0.18	9.8	Sea	11.00	80.7	9.49	0.02	0.86	1.34	1.29	0.66	0.18	0.00423	0.02703	0.00	-0.0036
215	14	6.73	0.15	9.8	Sea	26.50	2.3	8.26	0.41	1.42	3.62	2.91	2.15	1.09	0.00824	0.07373	12.38	0.0006
215	17	6.78	0.13	8.5	Sea	27.00	46.0	6.93	0.02	1.28	1.77	1.25	1.36	0.05	0.00296	0.06004	0.00	-0.0006
215	20	7.33	0.16	8.5	Sea	17.60	18.2	8.14	0.02	1.13	1.62	1.31	0.98	0.11	0.00364	0.04653	0.00	-0.0018
215	23	7.35	0.13	8.5	Sea	21.80	74.4	6.63	0.02	0.99	1.39	1.12	1.08	0.05	0.00288	0.03542	0.00	-0.0028
216	2	6.78	0.13	9.8	Sea	22.80	18.0	6.91	0.02	1.21	1.68	1.20	1.19	0.07	0.00321	0.05327	0.00	-0.0012
216	5	6.73	0.12	8.5	Sea	16.60	28.8	6.33	0.02	0.97	1.39	1.09	0.89	0.09	0.00339	0.03423	0.00	-0.0029
216	8	7.28	0.18	8.5	Sea	21.20	2.3	8.98	0.02	1.31	1.85	1.44	1.17	0.10	0.00356	0.06225	0.00	-0.0004
216	11	7.37	0.15	8.5	Sea	31.90	83.8	7.66	0.02	1.27	1.73	1.30	1.51	0.03	0.00260	0.05870	0.00	-0.0007
216	14	6.86	0.16	9.8	Sea	19.30	33.5	8.81	0.02	1.18	1.69	1.35	1.06	0.11	0.00357	0.05105	0.00	-0.0014
216	17	6.71	0.17	9.8	Sea	18.20	45.3	9.15	0.02	1.14	1.64	1.36	1.01	0.11	0.00363	0.04711	0.00	-0.0018
216	20	7.20	0.19	8.5	Sea	12.60	12.2	9.40	0.02	1.07	1.58	1.39	0.76	0.19	0.00431	0.04145	0.00	-0.0023
216	23	7.37	0.16	9.8	Sea	22.80	78.3	8.28	0.02	1.06	1.50	1.26	1.15	0.05	0.00297	0.04106	0.00	-0.0023
217	2	6.86	0.17	9.8	Sea	15.20	44.5	9.35	0.02	1.07	1.56	1.36	0.87	0.14	0.00392	0.04158	0.00	-0.0023
217	5	6.69	0.14	9.8	Sea	27.30	63.1	7.52	0.02	1.24	1.71	1.26	1.36	0.05	0.00288	0.05615	0.00	-0.0010
217	8	7.12	0.18	14.2	Sea	19.00	60.1	10.28	0.02	1.14	1.62	1.37	1.05	0.11	0.00360	0.04696	0.00	-0.0018
217	11	7.40	0.20	14.2	Sea	4.10	52.0	10.99	0.02	0.87	1.35	1.33	0.31	0.78	0.00715	0.02774	0.00	-0.0035
217	14	6.97	0.23	14.2	Sea	24.20	26.6	12.95	0.90	1.56	4.94	4.35	2.45	2.87	0.01334	0.08857	27.02	0.0019
217	17	6.68	0.18	11.6	Sea	21.00	12.3	10.23	0.02	1.35	1.89	1.49	1.18	0.12	0.00373	0.06604	0.00	-0.0001
217	20	7.05	0.18	9.8	Sea	13.40	84.7	9.83	0.02	0.90	1.38	1.33	0.77	0.14	0.00388	0.02963	0.00	-0.0034
217	23	7.33	0.20	11.6	Sea	9.80	59.6	10.66	0.02	0.96	1.46	1.38	0.62	0.28	0.00486	0.03371	0.00	-0.0030
218	2	6.96	0.20	11.6	Sea	14.10	33.9	10.93	0.02	1.15	1.67	1.47	0.85	0.20	0.00436	0.04781	0.00	-0.0017
218	5	6.66	0.23	11.6	Sea	16.90	3.1	12.97	0.77	1.39	4.66	4.33	1.74	3.06	0.01383	0.07027	23.20	0.0003
218	8	6.99	0.24	9.8	Sea	12.10	64.5	13.09	0.02	1.16	1.76	1.68	0.77	0.27	0.00482	0.04911	0.00	-0.0016
218	11	7.37	0.26	8.5	Sea	18.70	61.9	12.83	0.02	1.31	1.94	1.75	1.08	0.15	0.00397	0.06280	0.00	-0.0004
218	14	7.12	0.22	11.6	Sea	22.30	51.6	11.77	0.71	1.36	4.34	3.96	2.11	2.20	0.01153	0.06770	21.22	0.0001
218	17	6.72	0.20	14.2	Sea	16.30	15.8	11.42	0.02	1.25	1.78	1.50	0.98	0.19	0.00427	0.05698	0.00	-0.0009
218	20	6.92	0.27	11.6	Sea	8.10	60.2	15.12	0.02	1.21	1.84	1.79	0.58	0.56	0.00626	0.05307	0.00	-0.0013
218	23	7.29	0.35	14.2	Sea	14.70	37.6	19.47	1.33	1.63	6.49	6.27	1.86	6.31	0.02202	0.09641	39.95	0.0026
219	2	7.05	0.30	11.6	Sea	16.50	43.7	16.28	0.94	1.50	5.55	5.32	1.82	4.03	0.01630	0.08182	28.25	0.0013
219	5	6.70	0.30	18.3	Sea	21.10	17.0	17.95	1.54	1.74	6.39	5.86	2.61	5.90	0.02098	0.10980	46.14	0.0039

219	8	6.90	0.42	14.2	Sea	21.80	55.5	23.88	1.51	1.97	7.84	7.53	2.77	6.44	0.02234	0.14107	45.40	0.0067
219	11	7.39	0.63	14.2	Sea	9.50	42.6	34.43	1.97	2.34	10.48	10.39	1.58	13.49	0.04190	0.19944	58.24	0.0119
219	14	7.39	0.50	14.2	Sea	17.80	45.2	27.26	1.68	2.11	8.75	8.49	2.47	8.41	0.02743	0.16238	50.39	0.0086
219	17	6.88	0.81	14.2	Sea	26.70	37.4	46.23	0.49	3.38	9.23	8.78	3.14	5.02	0.01878	0.41500	12.52	0.0313
219	20	7.03	0.79	14.2	Sea	45.90	10.0	44.34	0.29	3.95	8.93	7.80	4.38	2.26	0.01172	0.56708	5.50	0.0450
219	23	7.37	0.86	5.1	Bay	9.40	34.5	30.97	0.53	2.45	8.89	8.84	1.06	4.36	0.01712	0.21817	15.07	0.0136
220	2	7.34	0.70	5.1	Bay	8.00	27.8	25.27	0.57	2.07	7.87	7.83	0.88	4.01	0.01624	0.15526	16.97	0.0079
220	5	7.04	0.77	5.1	Bay	17.70	74.1	29.13	0.62	2.34	8.92	8.86	1.90	3.61	0.01523	0.19953	17.72	0.0119
220	8	7.07	0.57	11.6	Sea	8.20	13.5	31.24	1.55	2.22	9.67	9.60	1.25	10.76	0.03384	0.17932	46.35	0.0101
220	11	7.45	0.39	4.4	Bay	21.70	88.9	11.05	0.02	1.18	1.84	1.76	1.16	0.08	0.00333	0.05095	0.00	-0.0014
220	14	7.46	0.35	9.8	Sea	41.50	68.0	18.12	0.77	2.12	6.46	5.82	3.84	2.00	0.01098	0.16373	23.17	0.0087
220	17	7.04	0.28	11.6	Sea	26.80	61.0	15.14	0.85	1.61	5.36	4.97	2.65	2.63	0.01271	0.09484	25.51	0.0025
220	20	6.95	0.25	8.5	Sea	5.70	23.1	12.72	0.02	1.10	1.71	1.67	0.41	0.61	0.00646	0.04399	0.00	-0.0021
220	23	7.28	0.25	9.8	Sea	4.00	1.1	12.82	0.02	1.06	1.65	1.62	0.31	0.85	0.00739	0.04056	0.00	-0.0024
221	2	7.39	0.27	9.8	Sea	14.50	53.5	13.94	0.02	1.30	1.94	1.79	0.90	0.25	0.00466	0.06163	0.00	-0.0005
221	5	7.06	0.29	9.8	Sea	24.20	59.4	15.56	0.74	1.60	5.39	5.08	2.38	2.55	0.01250	0.09316	22.27	0.0024
221	8	7.00	0.23	8.5	Sea	22.80	17.8	11.88	0.50	1.52	4.46	3.98	2.04	1.72	0.01017	0.08441	15.02	0.0016
221	11	7.34	0.20	7.5	Bay	3.70	38.0	9.53	0.02	0.85	1.38	1.36	0.27	0.58	0.00633	0.02657	0.00	-0.0036
221	14	7.51	0.22	8.5	Sea	21.00	87.1	10.91	0.02	1.10	1.63	1.52	1.11	0.08	0.00329	0.04418	0.00	-0.0021
221	17	7.23	0.20	9.8	Sea	17.90	23.2	10.36	0.02	1.26	1.81	1.51	1.03	0.14	0.00393	0.05764	0.00	-0.0008
221	20	6.98	0.24	8.5	Sea	12.00	2.1	12.47	0.02	1.25	1.87	1.70	0.77	0.29	0.00493	0.05702	0.00	-0.0009
221	23	7.26	0.28	8.5	Sea	9.40	15.5	13.97	0.02	1.27	1.93	1.83	0.64	0.43	0.00567	0.05885	0.00	-0.0007
222	2	7.42	0.42	5.1	Bay	13.20	67.7	14.94	0.39	1.39	4.93	4.87	1.21	1.92	0.01076	0.07035	11.76	0.0003
222	5	7.22	0.49	5.1	Bay	12.80	43.5	18.14	0.44	1.67	5.89	5.79	1.24	2.44	0.01218	0.10132	13.27	0.0031
222	8	7.09	0.78	4.4	Bay	20.10	34.8	23.57	0.44	2.24	7.50	7.29	1.94	2.35	0.01196	0.18333	13.19	0.0105
222	11	7.38	0.90	4.7	Bay	24.60	11.2	29.11	0.29	2.75	7.67	7.33	2.28	2.02	0.01104	0.27462	7.38	0.0187
222	14	7.69	0.71	5.1	Bay	11.10	56.0	24.32	0.55	2.01	7.61	7.56	1.18	3.53	0.01502	0.14750	16.50	0.0072
222	17	7.50	0.70	4.4	Bay	15.50	4.8	19.57	0.39	1.92	6.34	6.17	1.46	2.14	0.01137	0.13351	11.67	0.0060
222	20	7.14	0.70	5.1	Bay	24.10	74.4	26.07	0.57	2.23	8.13	8.02	2.41	2.74	0.01298	0.18146	16.97	0.0103
222	23	7.17	0.50	4.4	Bay	16.60	2.5	14.92	0.32	1.64	5.04	4.83	1.44	1.51	0.00957	0.09731	9.48	0.0027
223	2	7.39	0.42	4.7	Bay	11.30	81.6	13.56	0.02	1.24	2.01	1.99	0.72	0.27	0.00482	0.05568	0.00	-0.0010
223	5	7.21	0.28	7.5	Bay	8.10	39.2	13.31	0.02	1.19	1.85	1.79	0.56	0.45	0.00575	0.05179	0.00	-0.0014
223	8	6.90	0.21	8.5	Sea	18.00	10.9	10.70	0.02	1.31	1.90	1.59	1.04	0.15	0.00399	0.06261	0.00	-0.0004
223	11	7.04	0.20	6.7	Sea	12.30	57.8	9.18	0.02	0.98	1.51	1.40	0.72	0.17	0.00412	0.03515	0.00	-0.0029
223	14	7.42	0.28	6.1	Sea	15.60	10.9	11.87	0.02	1.35	2.02	1.79	0.94	0.20	0.00433	0.06655	0.00	-0.0000
223	17	7.40	0.33	6.7	Sea	20.60	77.7	14.84	0.51	1.41	4.94	4.84	1.88	1.89	0.01068	0.07249	15.27	0.0005
223	20	7.01	0.28	6.7	Bay	15.50	3.2	13.04	0.45	1.42	4.54	4.31	1.43	1.97	0.01090	0.07307	13.40	0.0005
223	23	6.94	0.23	6.7	Sea	19.30	32.8	10.83	0.02	1.34	1.97	1.67	1.10	0.13	0.00384	0.06580	0.00	-0.0001
224	2	7.26	0.25	7.5	Sea	8.10	8.5	11.81	0.02	1.12	1.73	1.64	0.55	0.40	0.00550	0.04556	0.00	-0.0019
224	5	7.30	0.24	6.7	Bay	9.90	7.2	10.83	0.02	1.11	1.71	1.59	0.63	0.29	0.00492	0.04518	0.00	-0.0020
224	8	6.96	0.21	7.5	Bay	14.10	2.1	10.48	0.02	1.20	1.78	1.56	0.85	0.19	0.00431	0.05225	0.00	-0.0013
224	11	6.95	0.15	6.1	Sea	8.00	36.9	6.52	0.02	0.75	1.19	1.10	0.48	0.19	0.00427	0.02056	0.00	-0.0042
224	14	7.33	0.30	5.1	Bay	11.30	36.0	11.00	0.02	1.17	1.82	1.71	0.70	0.24	0.00461	0.04964	0.00	-0.0016
224	17	7.43	0.34	6.7	Sea	18.10	77.8	14.97	0.52	1.38	4.97	4.89	1.69	2.08	0.01121	0.06883	15.57	0.0002
224	20	7.06	0.27	6.1	Bay	14.80	31.9	11.81	0.02	1.30	1.96	1.77	0.89	0.20	0.00436	0.06117	0.00	-0.0005
224	23	6.82	0.18	7.5	Sea	14.30	38.6	9.08	0.02	1.07	1.59	1.40	0.83	0.15	0.00398	0.04144	0.00	-0.0023
225	2	7.08	0.21	6.7	Sea	10.40	49.4	9.83	0.02	1.01	1.56	1.47	0.64	0.23	0.00455	0.03688	0.00	-0.0027
225	5	7.29	0.30	6.7	Sea	9.80	77.4	13.56	0.02	1.17	1.87	1.84	0.64	0.34	0.00521	0.05014	0.00	-0.0015
225	8	7.01	0.22	6.7	Sea	9.10	23.7	10.33	0.02	1.05	1.63	1.53	0.58	0.29	0.00494	0.04007	0.00	-0.0024
225	11	6.79	0.15	6.1	Sea	11.90	44.6	6.78	0.02	0.86	1.31	1.16	0.67	0.13	0.00378	0.02665	0.00	-0.0036
225	14	7.14	0.23	6.1	Sea	10.80	24.0	9.75	0.02	1.07	1.64	1.51	0.67	0.23	0.00453	0.04127	0.00	-0.0023
225	17	7.48	0.28	5.1	Bay	15.80	61.0	9.70	0.02	1.12	1.71	1.57	0.90	0.13	0.00380	0.04524	0.00	-0.0020
225	20	7.23	0.22	6.7	Sea	18.30	46.5	10.04	0.02	1.22	1.81	1.56	1.03	0.12	0.00374	0.05459	0.00	-0.0011
225	23	6.79	0.16	7.5	Bay	12.70	4.0	8.20	0.02	1.01	1.50	1.30	0.74	0.16	0.00408	0.03689	0.00	-0.0027
226	2	6.97	0.19	6.1	Sea	9.50	88.4	8.31	0.02	0.79	1.30	1.29	0.56	0.18	0.00419	0.02283	0.00	-0.0040
226	5	7.32	0.24	6.7	Sea	9.40	27.5	10.98	0.02	1.10	1.70	1.60	0.61	0.30	0.00500	0.04380	0.00	-0.0021
226	8	7.17	0.21	6.7	Bay	13.00	42.6	9.55	0.02	1.07	1.62	1.46	0.77	0.18	0.00417	0.04131	0.00	-0.0023
226	11	6.74	0.14	7.5	Sea	17.40	36.2	7.08	0.02	1.03	1.49	1.21	0.94	0.09	0.00343	0.03892	0.00	-0.0025
226	14	6.96	0.19	6.7	Sea	12.80	69.9	8.79	0.02	0.93	1.44	1.35	0.74	0.14	0.00391	0.03129	0.00	-0.0032
226	17	7.48	0.23	6.7	Sea	15.10	18.5	10.27	0.02	1.21	1.80	1.58	0.89	0.17	0.00415	0.05363	0.00	-0.0012

226	20	7.39	0.23	8.5	Sea	20.20	62.3	11.52	0.02	1.27	1.86	1.63	1.13	0.12	0.00367	0.05879	0.00	-0.0007
226	23	6.84	0.17	7.5	Sea	15.50	18.0	8.31	0.02	1.09	1.59	1.34	0.88	0.13	0.00382	0.04309	0.00	-0.0022
227	2	6.84	0.14	9.8	Sea	15.80	76.8	7.80	0.02	0.87	1.28	1.15	0.84	0.08	0.00335	0.02750	0.00	-0.0036
227	5	7.34	0.25	7.5	Sea	9.20	1.1	11.91	0.02	1.16	1.77	1.66	0.61	0.36	0.00529	0.04854	0.00	-0.0017
227	8	7.33	0.22	7.5	Sea	8.50	63.9	10.39	0.02	0.96	1.52	1.47	0.55	0.30	0.00498	0.03370	0.00	-0.0030
227	11	6.81	0.18	7.5	Sea	16.80	7.7	9.24	0.02	1.20	1.74	1.46	0.96	0.14	0.00387	0.05209	0.00	-0.0013
227	14	6.80	0.20	6.7	Sea	12.70	68.0	9.57	0.02	0.98	1.53	1.44	0.74	0.16	0.00407	0.03516	0.00	-0.0029
227	17	7.42	0.30	5.6	Bay	8.60	20.0	11.86	0.02	1.17	1.84	1.76	0.57	0.35	0.00525	0.04985	0.00	-0.0015
227	20	7.52	0.30	7.5	Sea	22.00	79.7	13.90	0.02	1.35	2.02	1.88	1.23	0.11	0.00366	0.06673	0.00	-0.0000
227	23	6.93	0.23	8.5	Sea	17.60	17.4	11.91	0.53	1.37	4.30	3.99	1.64	2.03	0.01107	0.06811	15.71	0.0001
228	2	6.72	0.15	7.5	Sea	21.70	43.0	7.65	0.02	1.18	1.67	1.31	1.14	0.08	0.00325	0.05062	0.00	-0.0015
228	5	7.24	0.26	6.1	Bay	21.20	3.7	11.31	0.35	1.49	4.18	3.78	1.77	1.25	0.00877	0.08042	10.32	0.0012
228	8	7.46	0.22	6.7	Sea	10.50	78.6	9.93	0.02	0.93	1.49	1.45	0.64	0.21	0.00440	0.03177	0.00	-0.0032
228	11	6.94	0.19	7.5	Sea	19.10	20.5	9.32	0.02	1.26	1.81	1.48	1.07	0.12	0.00370	0.05759	0.00	-0.0008
228	14	6.67	0.13	6.7	Bay	19.70	15.1	6.31	0.02	1.10	1.56	1.18	1.04	0.08	0.00326	0.04394	0.00	-0.0021
228	17	7.28	0.24	5.6	Bay	9.70	55.9	9.39	0.02	0.97	1.54	1.47	0.60	0.22	0.00452	0.03422	0.00	-0.0029
228	20	7.60	0.22	6.7	Sea	18.30	74.1	9.83	0.02	1.09	1.64	1.49	1.00	0.10	0.00351	0.04314	0.00	-0.0021
228	23	7.11	0.20	8.5	Sea	20.20	28.2	10.24	0.02	1.32	1.90	1.55	1.13	0.12	0.00373	0.06366	0.00	-0.0003
229	2	6.62	0.12	8.5	Sea	24.20	59.8	6.40	0.02	1.12	1.55	1.14	1.21	0.05	0.00289	0.04523	0.00	-0.0020
229	5	7.11	0.23	6.7	Bay	20.50	70.5	10.87	0.02	1.22	1.81	1.63	1.12	0.10	0.00351	0.05415	0.00	-0.0012
229	8	7.57	0.30	7.5	Sea	7.70	57.4	13.79	0.02	1.19	1.87	1.82	0.54	0.48	0.00589	0.05147	0.00	-0.0014
229	11	7.15	0.23	8.5	Sea	14.70	5.8	11.47	0.02	1.26	1.86	1.63	0.89	0.21	0.00442	0.05819	0.00	-0.0008
229	14	6.64	0.16	8.5	Sea	22.10	31.4	8.62	0.02	1.27	1.80	1.40	1.19	0.09	0.00341	0.05913	0.00	-0.0007
229	17	7.09	0.25	6.7	Sea	14.10	78.6	11.63	0.02	1.10	1.71	1.65	0.83	0.17	0.00416	0.04386	0.00	-0.0021
229	20	7.65	0.26	7.5	Sea	12.00	62.0	11.93	0.02	1.13	1.74	1.65	0.75	0.24	0.00462	0.04647	0.00	-0.0018
229	23	7.37	0.21	9.8	Sea	19.40	60.5	10.81	0.02	1.21	1.75	1.52	1.08	0.11	0.00365	0.05286	0.00	-0.0013
230	2	6.70	0.20	8.5	Sea	17.50	23.0	10.48	0.02	1.27	1.84	1.55	1.01	0.15	0.00397	0.05846	0.00	-0.0008
230	5	7.06	0.25	14.2	Sea	18.70	40.6	13.92	1.01	1.41	4.97	4.63	2.02	3.70	0.01546	0.07227	30.26	0.0005
230	8	7.74	0.37	6.7	Sea	21.00	18.7	16.05	0.51	1.75	5.54	5.19	1.98	2.14	0.01137	0.11173	15.15	0.0040
230	11	7.59	0.40	4.7	Bay	24.40	86.0	12.33	0.02	1.32	2.02	1.90	1.30	0.08	0.00332	0.06372	0.00	-0.0003
230	14	6.85	0.26	5.1	Bay	22.60	13.4	9.87	0.26	1.45	3.76	3.34	1.75	0.86	0.00742	0.07624	7.65	0.0008
230	17	7.02	0.90	4.7	Bay	18.90	5.4	30.81	0.32	2.71	8.03	7.82	1.86	2.58	0.01257	0.26651	8.42	0.0180
230	20	7.72	0.35	7.5	Bay	13.90	30.4	16.26	0.60	1.53	5.44	5.27	1.42	2.97	0.01360	0.08535	18.10	0.0017
230	23	7.63	0.30	14.2	Sea	12.30	49.6	16.40	1.21	1.36	5.52	5.38	1.50	5.63	0.02031	0.06743	36.15	0.0000
231	2	6.89	0.20	14.2	Sea	19.90	2.7	11.44	0.84	1.37	4.37	3.89	2.00	2.83	0.01323	0.06858	25.12	0.0001
231	5	6.90	0.20	11.6	Sea	12.90	36.9	10.99	0.02	1.11	1.63	1.46	0.79	0.22	0.00451	0.04487	0.00	-0.0020
231	8	7.62	0.28	6.1	Sea	19.50	5.6	11.27	0.35	1.43	4.11	3.77	1.65	1.32	0.00896	0.07458	10.44	0.0007
231	11	7.65	0.24	6.1	Sea	20.00	86.1	9.88	0.02	1.07	1.62	1.51	1.06	0.08	0.00328	0.04130	0.00	-0.0023
231	14	6.92	0.22	7.5	Bay	17.20	4.7	10.97	0.02	1.32	1.93	1.65	1.01	0.16	0.00409	0.06351	0.00	-0.0003
231	17	6.79	0.16	7.5	Sea	11.50	34.1	8.10	0.02	0.94	1.41	1.27	0.68	0.17	0.00414	0.03191	0.00	-0.0032
231	20	7.46	0.25	5.6	Bay	12.90	0.3	9.59	0.02	1.14	1.73	1.55	0.77	0.19	0.00426	0.04703	0.00	-0.0018
231	23	7.61	0.21	7.5	Sea	19.30	60.0	9.98	0.02	1.18	1.73	1.51	1.06	0.10	0.00357	0.05082	0.00	-0.0015
232	2	6.94	0.18	6.7	Sea	16.50	6.8	8.52	0.02	1.15	1.68	1.40	0.93	0.13	0.00378	0.04821	0.00	-0.0017
232	5	6.73	0.10	11.6	Sea	17.40	51.0	5.46	0.02	0.87	1.22	0.93	0.89	0.06	0.00309	0.02781	0.00	-0.0035
232	8	7.35	0.12	5.6	Bay	12.30	15.6	4.79	0.02	0.78	1.16	0.95	0.66	0.09	0.00344	0.02191	0.00	-0.0041
232	11	7.64	0.15	11.6	Sea	11.30	26.8	7.69	0.02	0.88	1.29	1.12	0.67	0.17	0.00415	0.02819	0.00	-0.0035
232	14	7.10	0.15	9.8	Sea	10.90	35.0	7.78	0.02	0.88	1.30	1.16	0.65	0.18	0.00418	0.02787	0.00	-0.0035
232	17	6.69	0.08	11.6	Sea	15.20	23.9	4.69	0.02	0.81	1.14	0.84	0.80	0.07	0.00321	0.02416	0.00	-0.0039
232	20	7.13	0.14	9.8	Sea	10.10	84.6	7.55	0.02	0.71	1.12	1.08	0.58	0.14	0.00393	0.01845	0.00	-0.0044
232	23	7.51	0.20	9.8	Sea	3.50	72.2	10.48	0.02	0.86	1.38	1.37	0.26	0.73	0.00693	0.02709	0.00	-0.0036
233	2	7.04	0.16	9.8	Sea	10.40	5.0	8.67	0.02	0.95	1.41	1.26	0.64	0.22	0.00450	0.03264	0.00	-0.0031
233	5	6.53	0.11	9.8	Sea	17.30	62.7	6.29	0.02	0.89	1.26	1.03	0.90	0.07	0.00314	0.02857	0.00	-0.0035
233	8	6.92	0.15	8.5	Sea	13.20	84.0	7.83	0.02	0.80	1.22	1.16	0.73	0.10	0.00356	0.02300	0.00	-0.0040
233	11	7.58	0.19	9.8	Sea	7.60	13.9	9.46	0.02	0.92	1.40	1.31	0.50	0.34	0.00522	0.03065	0.00	-0.0033
233	14	7.19	0.15	11.6	Sea	7.70	47.5	8.07	0.02	0.78	1.19	1.12	0.49	0.27	0.00481	0.02211	0.00	-0.0040
233	17	6.62	0.13	9.8	Sea	16.30	16.2	6.96	0.02	1.01	1.44	1.14	0.90	0.10	0.00355	0.03701	0.00	-0.0027
233	20	6.62	0.11	9.8	Sea	12.30	85.8	6.07	0.02	0.66	1.00	0.93	0.65	0.08	0.00329	0.01570	0.00	-0.0046
233	23	7.34	0.15	8.5	Sea	8.50	0.1	7.28	0.02	0.81	1.24	1.12	0.52	0.22	0.00449	0.02411	0.00	-0.0039
234	2	7.15	0.13	9.8	Sea	5.00	36.8	6.75	0.02	0.66	1.04	1.00	0.33	0.34	0.00519	0.01575	0.00	-0.0046
234	5	6.56	0.08	9.8	Sea	12.20	60.7	4.50	0.02	0.65	0.94	0.79	0.64	0.07	0.00319	0.01527	0.00	-0.0047

234	8	6.79	0.13	7.5	Sea	10.60	67.5	6.44	0.02	0.73	1.13	1.04	0.60	0.12	0.00375	0.01921	0.00	-0.0043
234	11	7.47	0.15	7.5	Sea	8.20	3.7	7.10	0.02	0.80	1.24	1.13	0.50	0.22	0.00447	0.02349	0.00	-0.0039
234	14	7.55	0.15	7.5	Bay	15.70	48.8	7.05	0.02	0.95	1.39	1.17	0.85	0.10	0.00348	0.03280	0.00	-0.0031
234	17	7.00	0.11	9.8	Sea	9.00	10.6	5.77	0.02	0.71	1.07	0.93	0.53	0.16	0.00406	0.01852	0.00	-0.0044
234	20	6.48	0.18	8.5	Sea	6.50	52.4	10.00	0.02	0.91	1.43	1.39	0.44	0.40	0.00550	0.02997	0.00	-0.0033
234	23	7.34	0.13	8.5	Sea	3.00	26.2	6.23	0.02	0.60	0.98	0.96	0.21	0.45	0.00576	0.01303	0.00	-0.0049
235	2	7.19	0.10	14.2	Sea	6.60	60.5	5.34	0.02	0.54	0.83	0.78	0.39	0.19	0.00425	0.01071	0.00	-0.0051
235	5	6.86	0.09	9.8	Sea	11.90	15.1	4.86	0.02	0.74	1.07	0.85	0.65	0.10	0.00350	0.01983	0.00	-0.0042
235	8	6.83	0.10	7.5	Bay	11.00	87.2	4.76	0.02	0.56	0.88	0.82	0.57	0.07	0.00317	0.01159	0.00	-0.0050
235	11	7.20	0.10	6.7	Bay	6.20	7.5	4.53	0.02	0.57	0.90	0.83	0.37	0.17	0.00413	0.01189	0.00	-0.0050
235	14	7.54	0.16	9.8	Sea	8.20	56.9	8.06	0.02	0.79	1.22	1.15	0.51	0.24	0.00461	0.02254	0.00	-0.0040
235	17	7.14	0.12	11.6	Sea	7.80	9.4	6.58	0.02	0.72	1.08	0.97	0.48	0.22	0.00450	0.01900	0.00	-0.0043
235	20	7.00	0.09	9.8	Sea	7.80	29.0	4.64	0.02	0.59	0.89	0.78	0.45	0.14	0.00390	0.01267	0.00	-0.0049
235	23	7.37	0.14	8.5	Sea	2.30	19.4	7.11	0.02	0.65	1.07	1.06	0.17	0.61	0.00644	0.01542	0.00	-0.0046
236	2	7.28	0.12	8.5	Sea	4.10	68.6	6.22	0.02	0.59	0.97	0.95	0.27	0.34	0.00521	0.01262	0.00	-0.0049
236	5	7.20	0.12	9.8	Sea	5.70	13.5	6.19	0.02	0.65	1.01	0.94	0.36	0.28	0.00484	0.01536	0.00	-0.0046
236	8	7.14	0.13	9.8	Sea	9.10	65.0	6.96	0.02	0.72	1.10	1.03	0.54	0.17	0.00412	0.01862	0.00	-0.0044
236	11	7.37	0.17	9.8	Sea	3.50	79.3	9.05	0.02	0.76	1.23	1.22	0.25	0.61	0.00648	0.02102	0.00	-0.0041
236	14	8.23	0.26	4.1	Bay	4.90	45.5	5.37	0.02	0.62	1.07	1.04	0.30	0.21	0.00445	0.01418	0.00	-0.0048
236	17	7.20	0.17	9.8	Sea	13.20	82.9	9.03	0.02	0.86	1.31	1.25	0.75	0.13	0.00378	0.02685	0.00	-0.0036
236	20	7.30	0.16	14.2	Sea	7.70	17.6	8.87	0.02	0.85	1.26	1.16	0.50	0.33	0.00516	0.02611	0.00	-0.0037
236	23	7.09	0.15	11.6	Sea	4.70	57.5	7.98	0.02	0.70	1.11	1.08	0.32	0.44	0.00572	0.01794	0.00	-0.0044
237	2	7.19	0.17	9.8	Sea	1.20	18.7	8.67	0.02	0.73	1.19	1.18	0.10	1.04	0.00806	0.01940	0.00	-0.0043
237	5	7.12	0.21	9.8	Sea	5.10	0.1	11.25	0.02	0.98	1.52	1.47	0.37	0.61	0.00647	0.03473	0.00	-0.0029
237	8	6.95	0.13	9.8	Sea	8.30	66.7	6.86	0.02	0.69	1.07	1.02	0.50	0.18	0.00424	0.01728	0.00	-0.0045
237	11	7.78	0.13	14.2	Sea	7.50	72.5	7.08	0.02	0.65	1.00	0.95	0.46	0.22	0.00446	0.01521	0.00	-0.0047
237	14	7.88	0.18	14.2	Sea	1.00	45.0	9.40	0.02	0.74	1.16	1.16	0.09	1.48	0.00947	0.01966	0.00	-0.0043
237	17	7.60	0.20	5.6	Bay	3.20	82.6	7.48	0.02	0.71	1.21	1.21	0.22	0.43	0.00566	0.01840	0.00	-0.0044
237	20	6.79	0.17	9.8	Sea	11.10	6.1	9.46	0.02	1.02	1.51	1.35	0.69	0.23	0.00455	0.03770	0.00	-0.0026
237	23	6.53	0.12	11.6	Sea	5.60	27.3	6.99	0.02	0.68	1.05	0.99	0.37	0.33	0.00515	0.01689	0.00	-0.0045
238	2	7.25	0.17	11.6	Sea	3.40	3.2	9.01	0.02	0.77	1.21	1.19	0.25	0.69	0.00679	0.02172	0.00	-0.0041
238	5	7.36	0.17	6.1	Bay	4.70	8.3	7.01	0.02	0.73	1.19	1.14	0.31	0.33	0.00516	0.01922	0.00	-0.0043
238	8	6.62	0.13	14.2	Sea	6.90	33.4	7.68	0.02	0.74	1.11	1.03	0.45	0.30	0.00501	0.01978	0.00	-0.0042
238	11	7.40	0.11	14.2	Sea	6.50	82.9	5.91	0.02	0.53	0.84	0.82	0.39	0.19	0.00431	0.01037	0.00	-0.0051
238	14	7.45	0.12	11.6	Sea	2.60	39.6	6.58	0.02	0.59	0.94	0.93	0.19	0.59	0.00637	0.01245	0.00	-0.0049
238	17	7.54	0.15	11.6	Sea	3.00	17.7	8.12	0.02	0.70	1.11	1.09	0.22	0.67	0.00672	0.01800	0.00	-0.0044
238	20	6.90	0.14	14.2	Sea	7.40	14.2	7.67	0.02	0.77	1.14	1.04	0.47	0.29	0.00492	0.02132	0.00	-0.0041
238	23	6.51	0.10	9.8	Sea	5.90	60.1	5.63	0.02	0.57	0.91	0.87	0.36	0.22	0.00449	0.01196	0.00	-0.0050
239	2	7.30	0.12	11.6	Sea	2.90	27.7	6.55	0.02	0.59	0.95	0.93	0.21	0.54	0.00618	0.01276	0.00	-0.0049
239	5	7.47	0.15	11.6	Sea	2.00	3.5	7.84	0.02	0.67	1.07	1.06	0.15	0.83	0.00733	0.01622	0.00	-0.0046
239	8	6.89	0.15	11.6	Sea	5.30	20.5	8.39	0.02	0.77	1.19	1.14	0.36	0.44	0.00569	0.02161	0.00	-0.0041
239	11	6.85	0.11	11.6	Sea	6.30	69.0	6.24	0.02	0.59	0.94	0.90	0.39	0.23	0.00455	0.01288	0.00	-0.0049
239	14	7.53	0.13	9.8	Sea	5.00	42.8	6.69	0.02	0.65	1.03	0.99	0.33	0.33	0.00516	0.01532	0.00	-0.0047
239	17	7.56	0.14	11.6	Sea	2.80	51.6	7.37	0.02	0.64	1.02	1.01	0.20	0.63	0.00653	0.01479	0.00	-0.0047
239	20	7.10	0.14	9.8	Sea	8.30	33.1	7.20	0.02	0.77	1.17	1.07	0.51	0.22	0.00448	0.02163	0.00	-0.0041
239	23	6.85	0.11	11.6	Sea	7.40	10.8	6.19	0.02	0.68	1.03	0.93	0.45	0.22	0.00447	0.01705	0.00	-0.0045
240	2	6.62	0.11	11.6	Sea	3.40	45.9	6.42	0.02	0.58	0.93	0.91	0.24	0.46	0.00582	0.01242	0.00	-0.0049
240	5	7.56	0.15	9.8	Sea	1.10	39.0	7.54	0.02	0.65	1.06	1.06	0.09	0.94	0.00772	0.01532	0.00	-0.0047
240	8	7.26	0.14	4.7	Bay	4.50	52.4	4.75	0.02	0.55	0.94	0.91	0.27	0.21	0.00440	0.01094	0.00	-0.0050
240	11	7.05	0.10	11.6	Sea	8.60	22.9	5.26	0.02	0.65	0.97	0.84	0.50	0.15	0.00398	0.01540	0.00	-0.0046
240	14	7.04	0.12	8.5	Sea	2.90	35.5	6.00	0.02	0.58	0.95	0.93	0.20	0.44	0.00571	0.01209	0.00	-0.0049
240	17	7.27	0.17	8.5	Sea	1.50	3.0	8.48	0.02	0.74	1.21	1.20	0.12	0.87	0.00746	0.01982	0.00	-0.0042
240	20	7.47	0.13	7.5	Bay	3.70	1.2	6.16	0.02	0.62	1.01	0.98	0.25	0.37	0.00536	0.01410	0.00	-0.0048
240	23	8.14	0.11	11.6	Sea	8.40	16.9	5.54	0.02	0.67	0.99	0.87	0.49	0.17	0.00410	0.01623	0.00	-0.0046
241	2	6.09	0.10	8.5	Sea	4.30	79.3	5.57	0.02	0.53	0.89	0.88	0.27	0.28	0.00487	0.01030	0.00	-0.0051
241	5	6.31	0.14	11.6	Sea	0.40	54.2	8.18	0.02	0.67	1.09	1.09	0.03	1.40	0.00922	0.01637	0.00	-0.0046
241	8	6.56	0.15	5.6	Bay	3.50	23.9	6.37	0.02	0.66	1.10	1.08	0.23	0.36	0.00528	0.01579	0.00	-0.0046
241	16	6.93	0.17	9.8	Sea	17.00	31.9	9.18	0.02	1.14	1.65	1.37	0.96	0.13	0.00380	0.04749	0.00	-0.0018
241	19	7.43	0.24	11.6	Sea	20.70	31.1	12.71	0.75	1.45	4.66	4.25	2.04	2.61	0.01264	0.07625	22.37	0.0008
241	22	7.22	0.18	11.6	Sea	12.70	84.9	10.00	0.02	0.88	1.35	1.30	0.74	0.15	0.00400	0.02842	0.00	-0.0035

242	1	6.60	0.15	11.6	Sea	29.60	10.3	8.54	0.49	1.53	3.89	3.02	2.46	1.22	0.00865	0.08476	14.71	0.0016
242	4	6.68	0.17	11.6	Sea	28.10	23.2	9.89	0.57	1.54	4.17	3.42	2.45	1.52	0.00960	0.08575	17.01	0.0017
242	7	7.21	0.23	5.6	Bay	17.90	34.6	9.27	0.02	1.22	1.81	1.54	1.00	0.12	0.00372	0.05408	0.00	-0.0012
242	10	7.12	0.20	11.6	Sea	13.50	2.9	10.68	0.02	1.15	1.67	1.45	0.83	0.22	0.00447	0.04809	0.00	-0.0017
242	13	6.62	0.15	11.6	Sea	27.50	0.8	8.30	0.49	1.45	3.73	2.94	2.29	1.24	0.00873	0.07631	14.60	0.0008
242	16	6.72	0.14	9.8	Sea	27.20	12.8	7.66	0.39	1.40	3.47	2.73	2.16	0.97	0.00781	0.07171	11.55	0.0004
242	19	7.32	0.26	14.2	Sea	10.70	8.8	14.47	0.02	1.27	1.86	1.72	0.73	0.43	0.00568	0.05907	0.00	-0.0007
242	22	7.29	0.20	5.6	Bay	21.30	86.7	7.87	0.02	0.99	1.47	1.32	1.07	0.05	0.00296	0.03561	0.00	-0.0028
243	1	6.76	0.16	11.6	Sea	18.90	46.9	9.15	0.02	1.14	1.62	1.33	1.04	0.10	0.00357	0.04727	0.00	-0.0018
243	4	6.74	0.23	11.6	Sea	31.10	31.8	13.16	0.71	1.79	5.19	4.41	2.89	2.04	0.01109	0.11631	21.29	0.0044
243	7	7.33	0.44	4.4	Bay	22.60	85.7	12.82	0.02	1.33	2.07	1.97	1.23	0.10	0.00350	0.06442	0.00	-0.0002
243	10	7.44	0.32	4.1	Bay	18.00	19.8	7.84	0.02	1.18	1.76	1.48	0.99	0.10	0.00355	0.05088	0.00	-0.0014
243	13	6.87	0.24	3.9	Bay	22.20	54.2	5.97	0.02	1.10	1.59	1.26	1.12	0.05	0.00298	0.04382	0.00	-0.0021
243	16	6.73	0.21	3.7	Bay	23.80	6.4	4.53	0.02	1.15	1.63	1.11	1.19	0.05	0.00290	0.04821	0.00	-0.0017
243	19	7.27	0.20	9.8	Sea	22.50	57.3	10.64	0.02	1.29	1.84	1.54	1.22	0.09	0.00346	0.06095	0.00	-0.0005
243	22	7.38	0.16	11.6	Sea	33.80	35.6	8.59	0.48	1.61	4.00	3.05	2.73	1.07	0.00816	0.09451	14.49	0.0025

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8909

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
244	1	6.83	0.16	11.6	Sea	25.50	89.1	8.93	0.02	1.08	1.51	1.28	1.25	0.04	0.00278	0.04247	0.00	-0.0022
244	4	6.61	0.13	11.6	Sea	24.50	14.5	7.34	0.02	1.29	1.77	1.23	1.28	0.07	0.00320	0.06010	0.00	-0.0006
244	7	7.13	0.22	8.5	Sea	17.90	55.5	10.98	0.02	1.21	1.78	1.57	1.02	0.13	0.00384	0.05357	0.00	-0.0012
244	10	7.36	0.18	11.6	Sea	28.60	21.4	9.89	0.57	1.56	4.20	3.43	2.49	1.51	0.00955	0.08798	16.92	0.0019
244	13	6.85	0.16	11.6	Sea	15.30	69.9	8.92	0.02	0.94	1.38	1.24	0.85	0.11	0.00363	0.03211	0.00	-0.0031
244	16	6.54	0.16	9.8	Sea	26.60	0.5	9.01	0.45	1.47	3.84	3.14	2.21	1.22	0.00867	0.07889	13.33	0.0011
244	19	6.97	0.24	9.8	Sea	14.20	83.0	13.11	0.02	1.12	1.71	1.66	0.86	0.20	0.00434	0.04564	0.00	-0.0019
244	22	7.20	0.25	11.6	Sea	15.60	12.4	13.37	0.80	1.37	4.74	4.45	1.64	3.32	0.01449	0.06828	24.07	0.0001
245	1	6.79	0.18	8.5	Sea	22.20	84.9	9.29	0.02	1.06	1.54	1.37	1.13	0.06	0.00305	0.04105	0.00	-0.0023
245	4	6.37	0.14	11.6	Sea	33.30	18.6	8.13	0.46	1.61	3.93	2.92	2.68	1.03	0.00804	0.09470	13.71	0.0025
245	7	6.85	0.23	9.8	Sea	30.50	78.2	12.50	0.62	1.46	4.45	4.14	2.65	1.51	0.00955	0.07797	18.53	0.0010
245	10	7.31	0.23	9.8	Sea	16.20	27.5	11.91	0.02	1.29	1.88	1.64	0.97	0.19	0.00429	0.06099	0.00	-0.0005
245	13	7.00	0.21	9.8	Sea	20.40	74.1	11.32	0.02	1.18	1.73	1.55	1.11	0.10	0.00351	0.05097	0.00	-0.0014
245	16	6.59	0.17	3.3	Bay	33.20	16.0	2.74	0.02	1.34	1.80	0.91	1.56	0.03	0.00255	0.06497	0.00	-0.0002
245	19	6.90	0.23	8.5	Sea	28.20	62.0	11.89	0.50	1.51	4.38	3.97	2.41	1.39	0.00918	0.08250	15.10	0.0014
245	22	7.31	0.20	8.5	Sea	24.90	1.5	9.80	0.42	1.48	3.96	3.36	2.08	1.26	0.00879	0.07933	12.54	0.0011
246	1	7.09	0.22	11.6	Sea	20.80	81.9	11.80	0.02	1.15	1.67	1.53	1.12	0.09	0.00343	0.04822	0.00	-0.0017
246	4	6.75	0.40	4.7	Bay	19.90	39.5	14.53	0.33	1.62	4.95	4.72	1.70	1.41	0.00924	0.09593	9.94	0.0026
246	7	7.05	0.77	4.7	Bay	15.50	88.7	26.28	0.54	2.09	8.12	8.11	1.61	3.17	0.01411	0.15937	16.26	0.0083
246	10	7.52	0.43	4.7	Bay	28.40	4.2	13.55	0.29	1.88	4.99	4.44	2.28	1.04	0.00805	0.12903	8.74	0.0056
246	13	7.34	0.32	5.1	Bay	32.40	55.4	11.41	0.28	1.69	4.30	3.80	2.45	0.75	0.00703	0.10394	8.31	0.0033
246	16	6.93	0.42	4.1	Bay	17.10	85.8	11.71	0.02	1.18	1.90	1.85	0.97	0.13	0.00380	0.05073	0.00	-0.0015
246	19	7.16	0.57	4.1	Bay	4.90	41.5	14.94	0.02	1.36	2.23	2.21	0.36	0.60	0.00643	0.06683	0.00	-0.0000
246	22	7.57	0.59	4.1	Bay	32.50	15.6	14.28	0.26	2.06	5.27	4.64	2.53	0.89	0.00753	0.15464	7.74	0.0079
247	1	7.43	0.53	4.1	Bay	32.40	51.2	13.16	0.25	1.84	4.77	4.30	2.46	0.77	0.00708	0.12352	7.46	0.0051
247	4	7.01	0.58	4.7	Bay	14.90	52.3	19.82	0.43	1.81	6.37	6.26	1.43	2.35	0.01195	0.11963	12.98	0.0047
247	7	7.20	0.63	4.4	Bay	10.20	70.6	18.79	0.40	1.64	6.01	5.99	0.98	2.38	0.01203	0.09748	11.93	0.0027
247	10	7.73	0.70	7.5	Bay	22.50	17.5	32.03	0.48	2.73	8.30	7.96	2.40	3.53	0.01504	0.27169	13.24	0.0184
247	13	7.67	0.86	8.5	Sea	27.20	47.1	41.47	0.34	3.23	8.74	8.41	2.84	3.23	0.01428	0.38031	8.38	0.0282
247	16	7.24	1.12	9.8	Sea	14.80	52.9	58.42	0.29	3.85	9.98	9.88	1.86	6.22	0.02179	0.53784	5.73	0.0424
247	19	7.28	0.99	8.5	Sea	14.60	15.0	49.64	0.30	3.50	9.36	9.20	1.75	5.28	0.01944	0.44590	6.74	0.0341
247	22	7.63	0.76	6.1	Bay	19.00	62.3	31.18	0.58	2.49	8.80	8.68	2.07	3.83	0.01579	0.22618	16.52	0.0143
248	1	7.61	0.79	9.8	Sea	10.20	32.4	40.22	0.68	2.80	9.53	9.44	1.38	7.88	0.02604	0.28587	19.16	0.0197
248	4	7.21	0.60	8.5	Sea	16.40	50.1	30.08	1.04	2.34	9.29	9.14	2.05	6.11	0.02153	0.19939	30.54	0.0119
248	7	7.21	0.54	8.5	Sea	14.00	5.6	27.15	0.99	2.20	8.57	8.39	1.73	5.91	0.02102	0.17643	29.61	0.0098
248	10	7.67	0.69	8.5	Sea	8.90	51.3	33.18	1.04	2.39	9.78	9.73	1.21	7.96	0.02624	0.20801	30.31	0.0127
248	13	7.68	0.55	8.5	Sea	11.60	28.1	26.72	0.99	2.10	8.39	8.28	1.46	6.20	0.02175	0.15982	29.72	0.0084
248	16	7.23	0.48	9.8	Sea	15.30	88.1	25.28	1.14	1.83	7.94	7.93	1.90	5.94	0.02109	0.12218	34.27	0.0050
248	19	7.13	0.42	18.3	Sea	12.20	25.1	23.91	2.02	1.80	7.79	7.59	1.85	10.77	0.03385	0.11765	60.64	0.0046
248	22	7.48	0.61	8.5	Sea	8.00	60.6	29.85	1.09	2.17	9.21	9.18	1.08	7.72	0.02562	0.17064	32.77	0.0093
249	1	7.57	0.59	18.3	Sea	4.80	31.5	32.32	2.58	2.09	10.02	9.98	0.93	19.02	0.06102	0.15859	77.21	0.0082
249	4	7.20	0.43	18.3	Sea	13.30	71.3	24.58	2.12	1.72	7.89	7.80	2.01	10.60	0.03337	0.10762	63.46	0.0037
249	7	7.07	0.42	18.3	Sea	12.40	25.4	24.08	2.03	1.81	7.84	7.64	1.88	10.78	0.03388	0.11945	60.88	0.0047
249	10	7.45	0.55	14.2	Sea	9.90	79.1	29.92	1.88	2.01	9.31	9.28	1.55	11.69	0.03650	0.14676	56.44	0.0072
249	13	7.63	0.49	14.2	Sea	7.90	45.3	26.51	1.72	1.87	8.38	8.32	1.21	11.07	0.03470	0.12659	51.52	0.0054
249	16	7.29	0.57	14.2	Sea	13.10	81.8	31.33	1.94	2.10	9.70	9.67	2.01	11.12	0.03483	0.16061	58.04	0.0084
249	19	7.07	0.50	8.5	Sea	14.00	48.0	25.51	0.96	2.03	8.07	7.94	1.69	5.50	0.01999	0.15007	28.73	0.0075
249	22	7.31	0.56	14.2	Sea	16.10	35.9	30.73	1.83	2.30	9.71	9.46	2.39	10.08	0.03194	0.19163	54.95	0.0112
250	1	7.49	0.56	18.3	Sea	14.10	19.4	31.23	2.41	2.25	9.91	9.65	2.34	13.53	0.04202	0.18455	72.38	0.0106
250	4	7.23	0.55	14.2	Sea	11.20	81.5	30.64	1.91	2.05	9.51	9.48	1.74	11.50	0.03594	0.15293	57.32	0.0077

250	7	7.01	0.50	14.2	Sea	16.70	21.1	27.95	1.70	2.19	8.98	8.68	2.37	8.96	0.02888	0.17493	50.91	0.0097
250	10	7.31	0.60	11.6	Sea	17.10	64.5	32.26	1.54	2.33	9.94	9.81	2.39	8.56	0.02783	0.19820	45.37	0.0118
250	13	7.60	0.54	14.2	Sea	9.10	31.6	29.00	1.81	2.05	9.10	9.00	1.42	11.66	0.03639	0.15263	54.27	0.0077
250	16	7.38	0.52	11.6	Sea	10.00	24.4	27.65	1.41	2.05	8.70	8.59	1.42	8.98	0.02895	0.15233	42.38	0.0077
250	19	7.03	0.57	14.2	Sea	14.70	29.4	32.24	1.77	2.36	9.89	9.67	2.22	10.65	0.03352	0.20270	52.37	0.0122
250	22	7.11	0.51	14.2	Sea	5.70	12.4	28.74	1.82	1.98	8.99	8.94	0.93	12.97	0.04030	0.14205	54.57	0.0068
251	1	7.40	0.56	14.2	Sea	8.50	9.5	30.41	1.87	2.13	9.49	9.39	1.37	12.48	0.03883	0.16538	56.02	0.0089
251	4	7.24	0.44	11.6	Sea	9.10	38.2	23.59	1.28	1.77	7.53	7.45	1.23	7.83	0.02591	0.11433	38.28	0.0043
251	7	6.97	0.49	14.2	Sea	10.10	53.3	27.70	1.76	1.96	8.73	8.64	1.53	10.75	0.03379	0.13908	52.82	0.0065
251	10	7.12	0.44	14.2	Sea	2.00	77.4	24.70	1.67	1.67	7.83	7.83	0.33	12.97	0.04029	0.10146	50.16	0.0031
251	13	7.49	0.49	14.2	Sea	8.40	11.2	26.62	1.71	1.92	8.43	8.34	1.28	10.94	0.03433	0.13360	51.18	0.0060
251	16	7.41	0.47	18.3	Sea	12.90	57.7	26.05	2.18	1.85	8.34	8.21	2.01	11.48	0.03587	0.12411	65.36	0.0051
251	19	7.04	0.43	11.6	Sea	11.30	86.9	23.70	1.31	1.68	7.52	7.51	1.49	7.28	0.02450	0.10288	39.28	0.0032
251	22	6.98	0.39	9.8	Sea	5.00	6.5	20.59	0.99	1.56	6.62	6.59	0.65	6.75	0.02314	0.08909	29.73	0.0020
252	1	7.28	0.42	11.6	Sea	8.20	2.3	22.49	1.23	1.72	7.22	7.14	1.10	7.69	0.02555	0.10716	36.98	0.0036
252	4	7.25	0.36	14.2	Sea	9.30	32.8	20.14	1.41	1.55	6.59	6.48	1.26	7.91	0.02612	0.08701	42.17	0.0018
252	7	6.96	0.33	14.2	Sea	4.00	41.5	18.78	0.02	1.36	2.05	2.03	0.35	1.50	0.00954	0.06685	0.00	-0.0000
252	10	6.94	0.29	9.8	Sea	12.70	7.2	15.35	0.77	1.43	5.21	5.03	1.37	3.72	0.01551	0.07447	22.97	0.0007
252	13	7.33	0.43	14.2	Sea	8.70	37.7	23.70	1.58	1.73	7.60	7.51	1.27	9.59	0.03059	0.10908	47.44	0.0038
252	16	7.43	0.48	14.2	Sea	14.10	14.0	26.03	1.63	2.03	8.38	8.15	2.00	8.92	0.02878	0.14935	48.94	0.0074
252	19	7.10	0.43	14.2	Sea	12.40	75.0	24.29	1.62	1.73	7.74	7.69	1.74	8.64	0.02804	0.10853	48.66	0.0037
252	22	6.87	0.40	11.6	Sea	10.90	40.6	22.31	1.22	1.73	7.19	7.08	1.42	6.95	0.02364	0.10899	36.56	0.0038
253	1	7.11	0.42	14.2	Sea	5.30	62.8	23.37	1.60	1.62	7.46	7.44	0.80	10.74	0.03376	0.09603	47.99	0.0026
253	4	7.27	0.40	14.2	Sea	5.40	9.6	21.98	1.52	1.58	7.08	7.03	0.80	10.07	0.03190	0.09122	45.61	0.0022
253	7	7.04	0.31	14.2	Sea	4.90	89.9	17.26	0.02	1.23	1.88	1.88	0.40	1.12	0.00833	0.05483	0.00	-0.0011
253	10	6.86	0.28	14.2	Sea	13.70	20.1	16.25	1.16	1.45	5.56	5.33	1.64	5.33	0.01955	0.07671	34.91	0.0009
253	13	7.16	0.33	11.6	Sea	8.10	31.5	17.71	1.05	1.41	5.83	5.76	1.01	6.01	0.02126	0.07244	31.49	0.0005
253	16	7.48	0.32	9.8	Sea	12.80	9.1	16.40	0.80	1.50	5.52	5.34	1.41	3.99	0.01621	0.08152	24.11	0.0013
253	19	7.25	0.29	11.6	Sea	14.10	55.2	15.75	0.95	1.37	5.31	5.17	1.58	4.20	0.01671	0.06848	28.32	0.0001
253	22	6.85	0.23	14.2	Sea	10.60	51.8	13.01	0.02	1.12	1.66	1.56	0.70	0.35	0.00525	0.04558	0.00	-0.0019
254	1	7.00	0.23	11.6	Sea	8.50	31.8	12.82	0.02	1.12	1.69	1.60	0.59	0.45	0.00577	0.04571	0.00	-0.0019
254	4	7.31	0.24	11.6	Sea	12.10	36.1	12.99	0.02	1.21	1.79	1.64	0.78	0.30	0.00500	0.05353	0.00	-0.0012
254	7	7.18	0.22	11.6	Sea	8.90	77.7	11.71	0.02	0.96	1.49	1.46	0.58	0.34	0.00519	0.03386	0.00	-0.0030
254	10	6.82	0.22	11.6	Sea	25.30	37.5	12.23	0.70	1.54	4.66	4.11	2.38	2.15	0.01139	0.08595	21.02	0.0017
254	13	6.98	0.20	11.6	Sea	20.20	16.3	10.86	0.02	1.35	1.91	1.54	1.15	0.14	0.00385	0.06678	0.00	-0.0000
254	16	7.43	0.25	7.5	Bay	6.10	65.0	11.71	0.02	1.02	1.62	1.60	0.43	0.48	0.00591	0.03756	0.00	-0.0026
254	19	7.40	0.20	11.6	Sea	10.20	39.9	10.61	0.02	1.01	1.51	1.39	0.65	0.28	0.00488	0.03724	0.00	-0.0027
254	22	6.92	0.15	11.6	Sea	9.60	55.7	8.25	0.02	0.82	1.23	1.14	0.58	0.21	0.00440	0.02430	0.00	-0.0038
255	1	6.93	0.17	9.8	Sea	11.40	4.5	8.92	0.02	0.99	1.47	1.29	0.69	0.21	0.00441	0.03581	0.00	-0.0028
255	4	7.34	0.15	9.8	Sea	8.30	85.4	7.99	0.02	0.72	1.14	1.12	0.50	0.21	0.00440	0.01861	0.00	-0.0044
255	7	7.43	0.19	11.6	Sea	11.00	17.8	10.16	0.02	1.04	1.53	1.37	0.69	0.26	0.00472	0.03906	0.00	-0.0025
255	10	6.97	0.17	14.2	Sea	19.20	55.5	9.55	0.02	1.12	1.59	1.31	1.05	0.10	0.00353	0.04587	0.00	-0.0019
255	13	6.90	0.18	8.5	Sea	22.90	4.9	9.56	0.42	1.40	3.81	3.28	1.93	1.29	0.00890	0.07100	12.50	0.0004
255	16	7.44	0.19	8.5	Sea	9.10	48.8	9.34	0.02	0.92	1.42	1.34	0.57	0.26	0.00473	0.03084	0.00	-0.0033
255	19	7.65	0.20	9.8	Sea	13.70	15.7	10.31	0.02	1.14	1.67	1.46	0.83	0.20	0.00435	0.04738	0.00	-0.0018
255	22	7.14	0.18	9.8	Sea	18.50	68.0	9.44	0.02	1.07	1.55	1.36	1.00	0.09	0.00347	0.04154	0.00	-0.0023
256	1	6.84	0.14	9.8	Sea	12.80	43.6	7.36	0.02	0.88	1.30	1.13	0.73	0.13	0.00382	0.02839	0.00	-0.0035
256	4	7.28	0.16	6.7	Bay	12.10	62.2	7.08	0.02	0.83	1.27	1.16	0.68	0.12	0.00373	0.02487	0.00	-0.0038
256	7	7.53	0.17	8.5	Sea	8.70	22.8	8.29	0.02	0.88	1.34	1.23	0.54	0.25	0.00466	0.02800	0.00	-0.0035
256	10	7.13	0.14	9.8	Sea	15.90	70.6	7.55	0.02	0.89	1.30	1.14	0.85	0.09	0.00336	0.02857	0.00	-0.0035
256	13	6.78	0.14	11.6	Sea	21.30	27.8	7.85	0.02	1.19	1.66	1.24	1.14	0.08	0.00336	0.05162	0.00	-0.0014
256	16	7.23	0.24	6.7	Bay	11.40	23.5	11.00	0.02	1.15	1.76	1.62	0.71	0.25	0.00469	0.04844	0.00	-0.0017
256	19	7.68	0.18	8.5	Sea	12.70	6.0	8.81	0.02	1.04	1.53	1.33	0.75	0.18	0.00420	0.03901	0.00	-0.0025
256	22	7.29	0.18	11.6	Sea	22.90	27.5	9.78	0.02	1.35	1.89	1.46	1.25	0.10	0.00352	0.06675	0.00	-0.0000
257	1	6.76	0.14	11.6	Sea	21.90	43.4	7.92	0.02	1.17	1.63	1.24	1.15	0.08	0.00326	0.04993	0.00	-0.0015
257	4	7.12	0.32	3.9	Bay	17.90	56.8	7.40	0.02	1.06	1.61	1.40	0.96	0.08	0.00335	0.04079	0.00	-0.0024
257	7	7.65	0.30	6.1	Bay	6.90	5.9	12.17	0.02	1.14	1.81	1.74	0.47	0.45	0.00575	0.04764	0.00	-0.0017
257	10	7.31	0.23	6.1	Bay	16.60	29.5	9.90	0.02	1.23	1.82	1.58	0.96	0.14	0.00392	0.05464	0.00	-0.0011
257	13	6.68	0.14	9.8	Sea	24.40	6.7	7.91	0.02	1.33	1.85	1.33	1.29	0.08	0.00329	0.06463	0.00	-0.0002
257	16	6.97	0.25	6.1	Bay	28.00	19.6	11.19	0.33	1.67	4.35	3.76	2.24	1.01	0.00797	0.10171	9.74	0.0031

257	19	7.60	0.35	5.1	Bay	6.70	30.4	12.02	0.02	1.15	1.84	1.79	0.46	0.42	0.00563	0.04772	0.00	-0.0017
257	22	7.34	0.22	8.5	Sea	9.50	47.2	10.92	0.02	1.04	1.59	1.51	0.61	0.30	0.00498	0.03906	0.00	-0.0025
258	1	6.61	0.12	8.5	Sea	17.90	18.6	6.35	0.02	1.03	1.46	1.11	0.96	0.08	0.00335	0.03835	0.00	-0.0026
258	4	6.77	0.18	6.7	Bay	22.40	19.3	8.49	0.02	1.32	1.88	1.46	1.21	0.09	0.00342	0.06331	0.00	-0.0003
258	7	7.49	0.30	5.6	Bay	11.80	1.8	11.71	0.02	1.25	1.92	1.77	0.74	0.26	0.00473	0.05695	0.00	-0.0009
258	10	7.40	0.22	7.5	Sea	17.40	71.8	10.51	0.02	1.11	1.67	1.53	0.97	0.12	0.00369	0.04486	0.00	-0.0020
258	13	6.71	0.18	7.5	Bay	13.00	22.8	9.28	0.02	1.07	1.60	1.42	0.77	0.18	0.00421	0.04189	0.00	-0.0023
258	16	6.73	0.14	6.1	Sea	32.30	51.1	6.56	0.20	1.43	3.05	2.35	2.19	0.41	0.00556	0.07447	6.08	0.0007
258	19	7.46	0.28	5.6	Bay	6.60	88.8	10.91	0.02	0.97	1.61	1.61	0.44	0.37	0.00536	0.03435	0.00	-0.0029
258	22	7.51	0.23	5.6	Bay	9.30	16.1	8.72	0.02	0.97	1.52	1.41	0.57	0.23	0.00455	0.03433	0.00	-0.0029
259	1	6.78	0.15	8.5	Sea	15.40	10.5	8.04	0.02	1.06	1.54	1.28	0.87	0.13	0.00380	0.04122	0.00	-0.0023
259	4	6.70	0.10	7.5	Bay	16.90	28.8	5.13	0.02	0.91	1.29	0.98	0.88	0.07	0.00318	0.03010	0.00	-0.0033
259	7	7.48	0.25	4.4	Bay	8.90	23.7	7.07	0.02	0.86	1.37	1.27	0.53	0.18	0.00422	0.02690	0.00	-0.0036
259	10	7.68	0.21	8.5	Sea	30.70	21.1	10.21	0.42	1.67	4.28	3.51	2.51	1.13	0.00836	0.10087	12.46	0.0030
259	13	6.98	0.17	9.8	Sea	15.50	55.6	9.20	0.02	1.03	1.51	1.33	0.88	0.13	0.00379	0.03874	0.00	-0.0025
259	16	6.69	0.12	6.7	Bay	20.40	9.9	5.76	0.02	1.09	1.54	1.12	1.06	0.07	0.00317	0.04321	0.00	-0.0021
259	19	7.27	0.37	4.7	Bay	7.40	78.1	12.09	0.02	1.11	1.83	1.82	0.49	0.37	0.00534	0.04469	0.00	-0.0020
259	22	7.52	0.23	8.5	Sea	22.50	9.4	11.29	0.48	1.49	4.29	3.81	1.99	1.63	0.00991	0.08057	14.40	0.0012
260	1	7.05	0.20	8.5	Sea	14.70	45.3	9.99	0.02	1.11	1.64	1.45	0.86	0.16	0.00406	0.04450	0.00	-0.0020
260	4	6.66	0.08	14.2	Sea	26.50	3.4	4.64	0.02	1.19	1.60	0.92	1.31	0.05	0.00284	0.05158	0.00	-0.0014
260	7	7.38	0.21	7.5	Bay	15.30	87.7	9.87	0.02	0.95	1.47	1.42	0.85	0.11	0.00365	0.03267	0.00	-0.0031
260	10	7.84	0.28	7.5	Bay	9.60	8.2	12.76	0.02	1.22	1.86	1.75	0.64	0.37	0.00536	0.05417	0.00	-0.0012
260	13	7.32	0.20	8.5	Sea	14.30	39.5	10.24	0.02	1.13	1.67	1.48	0.85	0.18	0.00417	0.04621	0.00	-0.0019
260	16	6.74	0.10	8.5	Sea	17.90	5.4	5.01	0.02	0.95	1.33	0.96	0.93	0.07	0.00316	0.03284	0.00	-0.0031
260	19	7.15	0.23	7.5	Bay	15.70	45.0	11.01	0.02	1.21	1.80	1.61	0.92	0.17	0.00411	0.05330	0.00	-0.0012
260	22	7.68	0.30	14.2	Sea	9.50	30.5	15.92	0.02	1.31	1.93	1.82	0.68	0.55	0.00622	0.06220	0.00	-0.0004
261	1	7.28	0.19	7.5	Bay	9.20	54.8	9.10	0.02	0.91	1.42	1.34	0.57	0.24	0.00461	0.03000	0.00	-0.0033
261	4	6.80	0.13	18.3	Sea	24.80	17.2	7.82	0.02	1.30	1.76	1.20	1.30	0.07	0.00323	0.06104	0.00	-0.0005
261	7	7.17	0.30	11.6	Sea	15.00	40.6	16.23	0.95	1.47	5.51	5.30	1.68	4.23	0.01680	0.07848	28.40	0.0010
261	10	7.84	0.30	5.6	Bay	14.00	28.5	10.90	0.02	1.23	1.87	1.70	0.84	0.19	0.00430	0.05527	0.00	-0.0011
261	13	7.57	0.27	14.2	Sea	16.30	33.9	14.48	1.05	1.39	5.09	4.80	1.83	4.23	0.01680	0.07077	31.60	0.0003
261	16	6.93	0.47	4.1	Bay	9.70	14.5	12.91	0.02	1.32	2.10	2.01	0.63	0.32	0.00510	0.06348	0.00	-0.0003
261	19	7.11	0.54	4.1	Bay	12.50	26.3	14.33	0.30	1.48	4.77	4.66	1.09	1.54	0.00965	0.07940	8.88	0.0011
261	22	7.78	0.85	5.6	Bay	13.80	11.5	31.58	0.47	2.58	8.57	8.44	1.51	3.87	0.01589	0.24140	12.98	0.0157
262	1	7.70	1.01	4.7	Bay	17.00	15.4	30.87	0.35	2.65	8.17	8.00	1.71	2.83	0.01322	0.25625	9.30	0.0170
262	4	7.21	1.04	4.7	Bay	12.80	64.2	34.57	0.36	2.69	8.75	8.70	1.36	3.48	0.01490	0.26410	9.66	0.0177
262	7	7.39	1.18	5.6	Bay	13.80	25.2	45.91	0.23	3.43	9.08	8.97	1.49	3.71	0.01550	0.42733	4.53	0.0324
262	10	8.02	0.77	5.6	Bay	13.80	26.9	27.68	0.67	2.32	8.70	8.58	1.54	4.16	0.01664	0.19509	19.38	0.0115
262	13	7.93	0.57	5.6	Bay	15.70	21.2	20.79	0.52	1.94	6.72	6.54	1.58	2.83	0.01323	0.13629	15.59	0.0062
262	16	7.21	0.45	9.8	Sea	12.40	54.1	23.80	1.07	1.85	7.59	7.49	1.55	6.09	0.02147	0.12439	32.15	0.0052
262	19	7.02	0.38	11.6	Sea	11.50	22.8	20.60	1.14	1.67	6.73	6.59	1.45	6.26	0.02189	0.10200	34.22	0.0032
262	22	7.52	0.63	5.1	Bay	2.90	19.2	21.91	0.52	1.77	6.91	6.90	0.32	4.08	0.01641	0.11382	15.66	0.0042
263	1	7.66	0.53	8.5	Sea	8.70	42.6	25.89	0.99	1.97	8.12	8.07	1.11	6.54	0.02260	0.14064	29.55	0.0066
263	4	7.14	0.33	8.5	Sea	6.80	13.7	16.71	0.73	1.39	5.49	5.44	0.77	4.44	0.01734	0.06986	21.93	0.0003
263	7	6.97	0.23	8.5	Sea	14.70	37.4	12.12	0.02	1.26	1.87	1.68	0.90	0.21	0.00443	0.05782	0.00	-0.0008
263	10	7.58	0.44	5.1	Bay	6.00	65.4	15.40	0.02	1.34	2.16	2.15	0.43	0.59	0.00638	0.06490	0.00	-0.0002
263	13	7.85	0.41	9.8	Sea	4.80	57.3	20.40	0.99	1.52	6.56	6.55	0.62	6.74	0.02311	0.08444	29.77	0.0016
263	16	7.35	0.34	9.8	Sea	7.60	85.8	17.41	0.02	1.32	2.05	2.04	0.56	0.66	0.00669	0.06327	0.00	-0.0003
263	19	6.99	0.23	9.8	Sea	15.00	11.2	12.40	0.02	1.31	1.92	1.68	0.92	0.23	0.00454	0.06268	0.00	-0.0004
263	22	7.27	0.32	9.8	Sea	10.20	76.5	16.64	0.02	1.31	2.02	1.99	0.70	0.46	0.00578	0.06290	0.00	-0.0004
264	1	7.62	0.41	8.5	Sea	2.50	77.7	19.90	0.85	1.50	6.40	6.40	0.31	6.26	0.02190	0.08134	25.34	0.0013
264	4	7.24	0.28	9.8	Sea	4.10	30.7	14.43	0.02	1.16	1.80	1.77	0.32	0.95	0.00774	0.04855	0.00	-0.0017
264	7	6.94	0.21	7.5	Bay	13.40	9.4	10.50	0.02	1.18	1.75	1.56	0.81	0.21	0.00439	0.05039	0.00	-0.0015
264	10	7.27	0.35	11.6	Sea	12.00	89.0	19.11	1.14	1.41	6.20	6.19	1.46	5.61	0.02027	0.07187	34.04	0.0004
264	13	7.71	0.53	7.5	Bay	6.50	2.1	24.41	0.83	1.89	7.68	7.64	0.80	5.87	0.02090	0.13009	24.98	0.0057
264	16	7.43	0.45	14.2	Sea	10.70	76.3	24.61	1.65	1.72	7.83	7.79	1.54	9.28	0.02975	0.10803	49.37	0.0037
264	19	6.98	0.43	14.2	Sea	4.40	41.9	24.57	1.65	1.70	7.80	7.78	0.69	11.69	0.03648	0.10520	49.54	0.0034
264	22	7.07	0.51	4.7	Bay	6.20	57.4	17.44	0.41	1.51	5.63	5.61	0.62	2.70	0.01287	0.08246	12.31	0.0014
265	1	7.49	0.68	4.7	Bay	8.60	0.1	21.59	0.47	1.87	6.84	6.78	0.89	3.11	0.01395	0.12694	13.98	0.0054
265	4	7.36	0.68	4.7	Bay	11.00	62.3	22.03	0.48	1.87	6.95	6.91	1.12	2.96	0.01356	0.12688	14.26	0.0054

265	7	6.94	0.56	5.6	Bay	6.20	70.9	23.07	0.59	1.83	7.25	7.24	0.69	4.18	0.01668	0.12174	17.70	0.0049
265	10	6.99	0.55	4.7	Bav	0.40	53.4	19.09	0.44	1.58	6.10	6.10	0.04	3.63	0.01528	0.09060	13.22	0.0021
265	13	7.40	0.78	5.1	Bav	15.60	7.6	27.80	0.51	2.41	8.33	8.17	1.65	3.41	0.01472	0.21146	14.63	0.0130
265	16	7.35	0.61	11.6	Sea	19.30	59.5	32.90	1.26	2.43	9.62	9.11	2.57	7.48	0.02501	[illegible]	[illegible]	
265	19	6.99	0.45	11.6	Sea	15.80	78.3	24.67	1.32	1.82	7.83	7.77	2.02	6.62	0.02280	0.11993	39.67	0.0048
265	22	6.77	0.35	5.1	Bav	7.60	1.4	13.76	0.02	1.30	2.06	1.99	0.52	0.45	0.00576	0.06137	0.00	-0.0005
266	1	7.07	0.35	6.1	Bav	4.90	72.0	15.34	0.02	1.28	2.06	2.05	0.37	0.72	0.00691	0.05964	0.00	-0.0007
266	4	7.18	0.29	11.8	Sea	3.20	84.4	15.67	0.02	1.17	1.82	1.81	0.27	1.28	0.00886	0.04945	0.00	-0.0016
266	7	6.87	0.22	9.8	Sea	4.60	44.4	11.83	0.02	0.99	1.55	1.52	0.34	0.69	0.00679	0.03540	0.00	-0.0028
266	10	6.75	0.17	8.5	Sea	15.10	59.4	8.69	0.02	0.99	1.47	1.30	0.85	0.12	0.00372	0.03564	0.00	-0.0028
266	13	7.07	0.31	6.7	Sea	12.20	88.3	14.53	0.02	1.22	1.95	1.93	0.77	0.28	0.00484	0.05438	0.00	-0.0011
266	16	7.31	0.30	9.8	Sea	1.30	9.1	15.65	0.02	1.20	1.88	1.88	0.12	1.74	0.01025	0.05210	0.00	-0.0013
266	19	7.52	1.13	4.7	Bav	20.50	0.3	35.60	0.23	3.05	8.18	7.94	1.98	2.36	0.01198	0.33741	5.39	0.0243
266	22	7.01	0.85	6.1	Bav	33.50	17.8	37.37	0.21	3.41	8.17	7.61	3.03	1.80	0.01042	0.42204	4.16	0.0320
267	1	7.26	0.68	5.6	Bav	12.90	27.5	26.88	0.63	2.24	8.37	8.26	1.43	4.05	0.01636	0.18333	19.00	0.0105
267	4	7.63	0.64	6.1	Bav	6.00	22.8	26.03	0.70	2.03	8.10	8.07	0.71	5.18	0.01919	0.15034	20.96	0.0075
267	7	7.44	0.87	5.6	Bav	7.50	35.2	33.86	0.50	2.57	9.06	9.02	0.88	5.01	0.01876	0.24020	14.09	0.0156
267	10	7.09	1.01	5.6	Bav	10.50	47.8	40.89	0.30	3.03	8.96	8.91	1.18	4.25	0.01667	0.33414	7.46	0.0240
267	13	7.20	0.57	5.6	Bav	2.30	55.1	22.73	0.59	1.79	7.15	7.15	0.27	4.68	0.01794	0.11643	17.59	0.0044
267	16	7.53	0.34	8.5	Sea	14.60	13.6	16.77	0.70	1.59	5.64	5.43	1.54	3.38	0.01466	0.09166	20.85	0.0022
267	19	7.42	0.26	4.7	Bav	14.70	33.5	8.42	0.02	1.09	1.66	1.46	0.84	0.13	0.00383	0.04326	0.00	-0.0021
267	22	6.99	0.21	4.1	Bav	6.90	76.2	5.73	0.02	0.64	1.10	1.08	0.40	0.16	0.00408	0.01507	0.00	-0.0047
268	1	7.05	0.20	5.6	Bav	3.80	13.9	8.16	0.02	0.80	1.33	1.30	0.26	0.43	0.00568	0.02346	0.00	-0.0039
268	4	7.43	0.29	7.5	Bav	4.10	17.3	13.79	0.02	1.16	1.84	1.81	0.31	0.81	0.00723	0.04899	0.00	-0.0016
268	7	7.43	0.28	9.8	Sea	6.10	60.2	14.21	0.02	1.15	1.78	1.75	0.45	0.66	0.00668	0.04785	0.00	-0.0017
268	10	7.03	0.31	3.7	Bav	5.70	43.5	6.21	0.02	0.72	1.23	1.19	0.35	0.21	0.00445	0.01893	0.00	-0.0043
268	13	7.03	0.34	5.6	Bav	7.30	40.8	13.79	0.02	1.26	2.00	1.95	0.51	0.47	0.00585	0.05744	0.00	-0.0009
268	16	7.48	0.37	5.6	Bav	3.80	26.1	14.43	0.02	1.25	2.02	2.00	0.29	0.77	0.00709	0.05686	0.00	-0.0009
268	19	7.58	0.42	6.1	Bav	8.80	39.8	17.41	0.53	1.51	5.67	5.61	0.91	3.13	0.01401	0.08321	15.78	0.0015
268	22	7.19	0.55	4.7	Bav	9.20	87.2	18.40	0.43	1.54	5.90	5.89	0.91	2.57	0.01255	0.08672	12.85	0.0018
269	1	7.00	0.46	8.5	Sea	1.20	7.6	23.41	0.94	1.72	7.40	7.40	0.16	7.67	0.02549	0.10726	28.20	0.0036
269	4	7.31	0.43	6.1	Bav	2.30	48.1	18.14	0.56	1.46	5.85	5.85	0.26	4.15	0.01659	0.07773	16.67	0.0010
269	7	7.44	0.31	8.5	Sea	2.60	3.5	15.32	0.02	1.22	1.92	1.91	0.22	1.22	0.00866	0.05393	0.00	-0.0012
269	10	7.16	0.20	9.8	Sea	6.90	19.9	10.58	0.02	0.97	1.49	1.42	0.47	0.43	0.00566	0.03428	0.00	-0.0029
269	13	6.90	0.25	4.4	Bav	14.60	50.7	7.91	0.02	1.02	1.57	1.41	0.82	0.12	0.00369	0.03760	0.00	-0.0026
269	16	7.37	0.25	7.5	Bav	5.90	79.7	12.06	0.02	1.02	1.64	1.63	0.41	0.51	0.00602	0.03762	0.00	-0.0026
269	19	7.68	0.23	7.5	Bav	4.60	6.6	10.74	0.02	0.97	1.54	1.50	0.33	0.57	0.00630	0.03395	0.00	-0.0030
269	22	7.37	0.41	7.5	Bav	5.40	86.3	19.23	0.72	1.48	6.19	6.19	0.63	4.80	0.01822	0.07994	21.69	0.0012
270	1	7.10	0.75	4.7	Bav	15.80	15.5	25.28	0.51	2.27	7.95	7.79	1.62	3.03	0.01376	0.18757	15.14	0.0109
270	4	7.51	0.70	5.1	Bav	10.50	27.7	24.44	0.55	2.06	7.66	7.58	1.13	3.61	0.01523	0.15444	16.43	0.0079
270	7	7.90	0.84	5.6	Bav	4.30	48.7	30.70	0.73	2.32	9.43	9.42	0.53	5.90	0.02099	0.19612	21.21	0.0116
270	10	7.63	0.97	6.1	Bav	4.70	66.8	39.53	0.42	2.83	9.26	9.25	0.58	6.01	0.02126	0.29113	11.14	0.0202
270	13	7.17	0.57	7.5	Bav	10.00	26.5	27.65	0.90	2.15	8.61	8.53	1.24	6.00	0.02123	0.16831	26.88	0.0091
270	16	7.39	0.51	7.5	Bav	2.10	48.9	24.08	0.84	1.79	7.57	7.57	0.27	6.72	0.02306	0.11719	25.16	0.0045
270	19	7.76	0.38	6.1	Bav	8.70	2.5	15.32	0.48	1.40	5.07	4.99	0.87	2.74	0.01300	0.07133	14.32	0.0004
270	22	7.49	0.29	8.5	Sea	13.90	72.0	14.22	0.02	1.25	1.92	1.84	0.87	0.24	0.00465	0.05724	0.00	-0.0009
271	1	7.01	0.20	9.8	Sea	5.60	22.8	10.77	0.02	0.95	1.48	1.43	0.40	0.53	0.00613	0.03292	0.00	-0.0031
271	4	7.20	0.23	4.4	Bav	6.10	38.3	6.75	0.02	0.76	1.26	1.21	0.38	0.23	0.00458	0.02083	0.00	-0.0042
271	7	7.69	0.24	8.5	Sea	5.30	31.7	11.51	0.02	1.01	1.58	1.54	0.38	0.57	0.00631	0.03685	0.00	-0.0027
271	13	6.78	0.16	7.9	Sea	33.50	33.5	7.99	0.31	1.60	3.69	2.83	2.49	0.69	0.00679	0.09297	9.15	0.0023
271	16	7.15	0.23	6.5	Sea	23.20	63.4	10.35	0.02	1.30	1.90	1.62	1.24	0.08	0.00336	0.06171	0.00	-0.0005
271	19	7.43	0.24	7.2	Sea	21.30	29.9	11.25	0.41	1.43	4.15	3.77	1.83	1.43	0.00931	0.07438	12.32	0.0007
271	22	7.05	0.20	9.3	Sea	17.80	61.5	10.60	0.02	1.15	1.69	1.50	1.00	0.12	0.00374	0.04839	0.00	-0.0017
272	1	6.66	0.13	8.7	Sea	21.40	38.9	6.99	0.02	1.13	1.59	1.20	1.12	0.07	0.00320	0.04684	0.00	-0.0018
272	4	7.05	0.23	6.0	Sea	17.30	42.5	10.16	0.02	1.23	1.83	1.60	0.99	0.13	0.00385	0.05504	0.00	-0.0011
272	7	7.44	0.29	6.2	Sea	21.80	28.1	12.06	0.37	1.52	4.37	4.01	1.85	1.34	0.00904	0.08375	11.05	0.0015
272	10	7.08	0.23	6.0	Sea	19.00	66.9	9.99	0.02	1.16	1.74	1.56	1.04	0.10	0.00354	0.04928	0.00	-0.0016
272	13	6.58	0.13	8.7	Sea	29.60	18.9	6.89	0.30	1.44	3.30	2.49	2.90	[illegible]	[illegible]			
272	16	6.82	0.17	7.0	Sea	29.40	88.0	8.08	0.02	1.19	1.65	1.35	1.41	0.03	0.00265	0.05153	0.00	-0.0014
272	19	7.26	0.23	6.7	Sea	13.40	0.9	10.20	0.02	1.17	1.76	1.56	0.81	[illegible]				

272	22	7.00	0.20	8.4	Sea	7.00	81.7	10.08	0.02	0.87	1.40	1.38	0.46	0.35	0.00525	0.02761	0.00	-0.0035
273	1	6.50	0.11	8.1	Sea	29.50	37.3	6.07	0.02	1.35	1.84	1.19	1.46	0.05	0.00286	0.06603	0.00	-0.0001
273	4	6.78	0.14	5.9	Bav	32.60	88.8	6.19	0.02	1.22	1.65	1.21	1.51	0.03	0.00247	0.05456	0.00	-0.0011
273	7	7.34	0.30	6.7	Sea	21.50	19.8	13.34	0.43	1.60	4.77	4.39	1.91	1.65	0.00998	0.09290	12.89	0.0023
273	10	7.17	0.23	8.1	Sea	18.60	82.4	11.57	0.02	1.13	1.70	1.60	1.03	0.11	0.00362	0.04627	0.00	-0.0019
273	13	6.60	0.18	7.9	Sea	25.50	1.3	9.39	0.37	1.48	3.84	3.23	2.07	1.09	0.00823	0.07934	11.10	0.0011
273	16	6.78	0.19	6.8	Sea	24.60	76.2	9.27	0.02	1.20	1.72	1.47	1.26	0.06	0.00305	0.05214	0.00	-0.0013
273	19	7.29	0.25	6.8	Sea	26.50	11.0	11.33	0.37	1.64	4.39	3.81	2.19	1.19	0.00857	0.09736	11.14	0.0027
273	22	7.22	0.20	11.4	Sea	31.10	77.2	10.93	0.64	1.41	4.08	3.68	2.65	1.38	0.00917	0.07219	19.02	0.0005

Results from Grant-Madsen wave/current model
THIMBLE SHOALS DATA - From CBW8910

Ds = 0.0170 cm
k'biol = 0.50 cm
Zc = 150.00 cm

day	time	depth	H	T	srce	Uc	Phi	Ub	Zo	u*s	u*t	u*wm	u*c	Z'o	Cd	Shlds	Kbr	C*
Jln	hour	m	cm	sec	--	cm/s	deg	cm/s	cm	cm/s	cm/s	cm/s	cm/s	cm	--	---	cm	cm
274	1	6.74	0.20	6.5	Sea	16.60	36.7	9.29	0.02	1.16	1.72	1.49	0.94	0.13	0.00381	0.04924	0.00	-0.0016
274	4	6.88	0.19	10.4	Sea	8.60	38.0	10.43	0.02	0.98	1.48	1.39	0.56	0.33	0.00516	0.03469	0.00	-0.0029
274	7	7.43	0.21	10.0	Sea	28.00	19.6	11.11	0.54	1.62	4.48	3.78	2.46	1.57	0.00974	0.09568	16.13	0.0026
274	10	7.44	0.19	7.4	Sea	42.40	53.9	8.81	0.30	1.84	4.10	3.09	3.05	0.58	0.00633	0.12373	8.97	[illegible]
274	13	6.88	0.17	8.1	Sea	10.00	52.9	8.87	0.02	0.91	1.39	1.30	0.61	0.21	0.00444	0.02982	0.00	-0.0033
274	16	6.90	0.21	10.0	Sea	20.30	41.0	11.57	0.02	1.35	1.94	1.63	1.15	0.13	0.00383	0.06662	0.00	[illegible]
274	19	7.36	0.32	6.5	Sea	21.60	20.7	13.94	0.43	1.64	4.94	4.57	1.93	1.70	0.01013	0.09787	12.99	0.0028
274	22	7.37	0.31	6.2	Sea	8.50	24.2	13.22	0.02	1.24	1.94	1.86	0.58	0.41	0.00556	0.05619	0.00	-0.0010
275	1	6.83	0.23	7.0	Bav	17.60	1.9	11.27	0.41	1.36	4.08	3.78	1.55	1.59	0.00981	0.06738	12.25	0.0000
275	4	6.88	0.23	9.0	Sea	21.90	63.1	11.88	0.02	1.32	1.92	1.67	1.21	0.11	0.00359	0.06385	0.00	-0.0003
275	7	7.38	0.30	6.0	Sea	15.60	23.4	12.72	0.39	1.40	4.41	4.20	1.40	1.71	0.01016	0.07086	11.75	0.0003
275	10	7.48	0.30	8.1	Sea	13.30	64.6	14.53	0.02	1.30	1.99	1.89	0.84	0.27	0.00483	0.06150	0.00	-0.0005
275	13	6.95	0.24	7.9	Sea	13.90	23.8	12.29	0.02	1.29	1.92	1.73	0.86	0.24	0.00459	0.06015	0.00	-0.0006
275	16	6.82	0.22	7.9	Sea	22.50	51.3	11.27	0.46	1.38	4.11	3.78	1.94	1.46	0.00941	0.06925	13.69	0.0002
275	19	7.21	0.32	6.3	Sea	16.90	80.5	13.87	0.02	1.28	1.99	1.92	1.00	0.17	0.00413	0.05983	0.00	-0.0006
275	22	7.36	0.32	6.7	Sea	2.80	45.7	14.25	0.02	1.19	1.91	1.90	0.22	0.96	0.00779	0.05117	0.00	-0.0014
276	1	6.90	0.22	7.9	Sea	19.80	24.8	10.98	0.45	1.37	4.06	3.70	1.74	1.58	0.00977	0.06845	13.37	0.0001
276	4	6.79	0.19	8.1	Sea	27.70	46.4	9.72	0.40	1.46	3.87	3.32	2.23	1.05	0.00811	0.07777	11.90	0.0010
276	7	7.25	0.27	7.4	Sea	22.10	64.5	12.84	0.49	1.40	4.47	4.25	1.96	1.64	0.00996	0.07107	14.62	0.0004
276	10	7.49	0.29	7.4	Sea	10.80	52.0	13.48	0.02	1.24	1.91	1.82	0.71	0.33	0.00514	0.05570	0.00	-0.0010
276	13	7.01	0.24	7.9	Sea	18.20	42.9	12.02	0.02	1.34	1.97	1.72	1.06	0.16	0.00403	0.06536	0.00	-0.0001
276	16	6.76	0.21	8.7	Sea	23.60	17.5	11.37	0.49	1.52	4.34	3.83	2.08	1.61	0.00985	0.08356	14.65	0.0015
276	19	7.06	0.21	8.4	Sea	22.20	85.1	10.69	0.02	1.13	1.66	1.52	1.16	0.07	0.00321	0.04666	0.00	-0.0018
276	22	7.42	0.53	4.8	Bav	12.00	77.1	17.39	0.41	1.52	5.62	5.59	1.14	2.23	0.01162	0.08414	12.35	0.0015
277	1	7.16	0.92	5.4	Bav	22.30	36.8	35.70	0.28	2.99	8.28	8.04	2.19	2.56	0.01251	0.32439	6.78	0.0232
277	4	6.93	0.74	5.0	Bav	32.60	24.0	27.28	0.26	2.82	7.30	6.77	2.83	1.50	0.00954	0.28873	6.39	0.0200
277	7	7.23	0.65	5.3	Bav	16.20	63.1	24.67	0.57	2.08	7.74	7.65	1.69	3.21	0.01422	0.15782	17.03	0.0082
277	10	7.49	0.42	5.6	Bav	25.60	13.8	16.31	0.41	1.94	5.71	5.25	2.27	1.64	0.00996	0.13681	12.35	0.0063
277	13	7.14	0.35	5.5	Bav	28.90	55.9	13.94	0.36	1.73	4.93	4.55	2.38	1.16	0.00848	0.10839	10.83	0.0037
277	16	6.73	0.28	4.3	Bav	26.80	56.3	8.58	0.19	1.37	3.31	2.93	1.88	0.50	0.00601	0.06871	5.70	0.0002
277	19	6.84	0.23	4.5	Bav	9.80	28.6	7.71	0.02	0.92	1.46	1.35	0.58	0.18	0.00422	0.03094	0.00	-0.0032
277	22	7.13	0.19	4.2	Bav	18.50	0.9	5.33	0.02	1.03	1.50	1.15	0.96	0.07	0.00319	0.03867	0.00	-0.0025
278	1	6.99	0.20	7.2	Bav	5.40	61.9	9.92	0.02	0.89	1.44	1.42	0.37	0.44	0.00571	0.02909	0.00	-0.0034
278	4	6.73	0.67	5.1	Bav	33.80	41.2	25.99	0.30	2.68	7.29	6.80	2.95	1.55	0.00967	0.26201	7.92	0.0176
278	7	6.89	0.30	4.8	Bav	16.40	42.9	10.79	0.02	1.27	1.94	1.75	0.95	0.15	0.00399	0.05897	0.00	-0.0007
278	10	7.33	0.17	15.5	Sea	24.40	5.5	9.15	0.73	1.38	3.92	3.21	2.26	1.99	0.01096	0.06903	21.90	0.0002
278	13	7.13	0.18	4.5	Bav	24.20	62.1	5.61	0.02	1.10	1.55	1.18	1.19	0.04	0.00282	0.04365	0.00	-0.0021
278	16	6.68	0.15	4.0	Bav	5.70	46.7	4.22	0.02	0.55	0.92	0.88	0.33	0.15	0.00396	0.01084	0.00	-0.0051
278	19	6.68	0.11	14.6	Sea	8.80	26.6	6.44	0.02	0.72	1.05	0.92	0.53	0.19	0.00427	0.01861	0.00	-0.0044
278	22	7.00	0.09	15.5	Sea	17.80	24.5	5.00	0.02	0.90	1.24	0.86	0.92	0.06	0.00312	0.02979	0.00	-0.0033
279	1	6.88	0.11	15.5	Sea	14.70	38.6	6.54	0.02	0.87	1.23	0.98	0.80	0.10	0.00351	0.02765	0.00	-0.0035
279	4	6.54	0.12	15.5	Sea	7.70	70.8	7.02	0.02	0.64	0.98	0.93	0.47	0.21	0.00441	0.01507	0.00	-0.0047
279	7	6.58	0.15	14.6	Sea	26.10	78.2	8.72	0.02	1.15	1.58	1.25	1.29	0.05	0.00285	0.04831	0.00	-0.0017
279	10	7.04	0.11	13.8	Sea	18.90	40.0	6.39	0.02	0.99	1.38	1.02	0.99	0.07	0.00321	0.03597	0.00	-0.0028
279	13	7.11	0.12	15.5	Sea	14.20	2.0	6.76	0.02	0.91	1.29	1.01	0.80	0.12	0.00371	0.03024	0.00	-0.0033
279	16	6.77	0.11	15.5	Sea	8.30	70.2	6.37	0.02	0.62	0.93	0.87	0.49	0.16	0.00409	0.01382	0.00	-0.0048
279	19	6.66	0.10	15.5	Sea	14.50	53.0	6.07	0.02	0.80	1.14	0.91	0.77	0.08	0.00335	0.02346	0.00	-0.0039
279	22	6.98	0.11	13.8	Sea	19.90	33.4	6.37	0.02	1.04	1.44	1.04	1.04	0.07	0.00320	0.03935	0.00	-0.0025
280	1	7.04	0.11	14.6	Sea	16.40	18.9	6.20	0.02	0.94	1.31	0.98	0.88	0.09	0.00342	0.03217	0.00	-0.0031
280	4	6.83	0.10	15.5	Sea	3.90	11.3	6.05	0.02	0.56	0.87	0.83	0.27	0.43	0.00564	0.01153	0.00	-0.0050

280	7	6.87	0.46	4.2	Bay	20.80	8.1	13.43	0.27	1.66	4.70	4.38	1.70	1.13	0.00836	0.10014	8.14	0.0030
280	10	7.22	0.63	4.8	Bav	16.30	40.8	21.14	0.45	1.96	6.77	6.63	1.59	2.46	0.01225	0.14000	13.56	0.0066
280	13	7.43	0.30	5.5	Bav	13.20	32.8	11.42	0.02	1.24	1.90	1.75	0.81	0.22	0.00446	0.05592	0.00	-0.0010
280	16	7.16	0.28	5.0	Bav	15.40	85.4	9.85	0.02	1.01	1.61	1.56	0.86	0.12	0.00369	0.03703	0.00	-0.0027
280	19	6.88	0.49	4.8	Bav	18.00	75.7	17.40	0.40	1.60	5.64	5.57	1.64	1.85	0.01056	0.09335	12.10	0.0024
280	22	7.07	0.41	4.4	Bav	12.10	25.0	12.41	0.02	1.33	2.08	1.94	0.76	0.25	0.00470	0.06394	0.00	-0.0003
281	1	7.31	0.24	14.6	Sea	12.40	9.4	13.36	0.02	1.25	1.82	1.63	0.81	0.33	0.00514	0.05714	0.00	-0.0009
281	4	7.11	0.31	4.7	Bav	15.90	50.0	10.37	0.02	1.21	1.86	1.69	0.92	0.15	0.00395	0.05346	0.00	-0.0012
281	7	6.90	0.28	4.1	Bav	10.10	39.9	7.71	0.02	0.92	1.48	1.38	0.60	0.17	0.00414	0.03109	0.00	-0.0032
281	10	7.12	0.23	3.6	Bav	15.40	30.1	4.26	0.02	0.84	1.25	0.99	0.79	0.06	0.00311	0.02577	0.00	-0.0037
281	13	7.39	0.20	3.7	Bav	17.50	19.4	3.91	0.02	0.89	1.29	0.96	0.89	0.06	0.00299	0.02903	0.00	-0.0034
281	16	7.25	0.22	4.2	Bav	22.20	45.4	5.99	0.02	1.12	1.62	1.25	1.13	0.06	0.00303	0.04588	0.00	-0.0019
281	19	6.88	0.15	13.1	Sea	7.90	39.6	8.75	0.02	0.83	1.25	1.16	0.51	0.30	0.00499	0.02500	0.00	-0.0038
281	22	7.00	0.21	11.9	Sea	22.50	62.3	11.37	0.02	1.29	1.83	1.55	1.22	0.10	0.00348	0.06065	0.00	-0.0006
282	1	7.37	0.42	4.3	Bav	15.30	33.5	11.66	0.02	1.34	2.07	1.89	0.91	0.18	0.00423	0.06561	0.00	-0.0001
282	4	7.28	0.34	4.2	Bav	14.90	41.6	8.85	0.02	1.12	1.73	1.56	0.85	0.13	0.00384	0.04578	0.00	-0.0019
282	7	7.01	0.39	4.5	Bav	32.20	2.4	12.47	0.25	1.94	4.81	4.13	2.47	0.81	0.00726	0.13669	7.60	0.0063
282	10	7.03	0.28	4.2	Bav	19.90	25.6	8.01	0.02	1.24	1.83	1.50	1.08	0.09	0.00345	0.05586	0.00	-0.0010
282	13	7.40	0.20	4.7	Bav	23.80	4.1	6.43	0.02	1.27	1.80	1.32	1.23	0.07	0.00314	0.05857	0.00	-0.0008
282	16	7.40	0.13	13.8	Sea	31.60	47.2	7.14	0.50	1.42	3.46	2.59	2.52	0.99	0.00790	0.07287	15.09	0.0005
282	19	7.02	0.14	7.4	Bav	22.10	83.0	7.04	0.02	0.97	1.39	1.17	1.09	0.05	0.00284	0.03452	0.00	-0.0029
282	22	6.97	0.12	12.5	Sea	11.30	15.1	6.63	0.02	0.82	1.19	1.00	0.65	0.15	0.00396	0.02449	0.00	-0.0038
283	1	7.24	0.13	13.1	Sea	16.80	2.5	6.86	0.02	1.01	1.42	1.08	0.92	0.10	0.00352	0.03705	0.00	-0.0027
283	4	7.35	0.12	13.1	Sea	20.90	50.5	6.58	0.02	1.04	1.44	1.06	1.07	0.06	0.00308	0.03920	0.00	-0.0025
283	7	6.99	0.12	11.9	Sea	12.80	49.2	6.74	0.02	0.82	1.19	1.02	0.71	0.11	0.00367	0.02439	0.00	-0.0038
283	10	6.83	0.11	11.4	Sea	20.30	30.5	6.23	0.02	1.06	1.47	1.06	1.06	0.07	0.00318	0.04091	0.00	-0.0023
283	13	7.20	0.17	8.7	Sea	17.90	75.5	8.63	0.02	0.98	1.44	1.29	0.95	0.08	0.00334	0.03500	0.00	-0.0029
283	16	7.41	0.18	8.4	Sea	14.20	30.2	8.97	0.02	1.07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
283	19	7.09	0.20	9.7	Sea	15.20	83.5	10.39	0.02	0.97	1.48	1.40	0.86	0.12	0.00376	0.03445	0.00	[illegible]
283	22	6.72	0.19	5.5	Bav	23.60	40.5	[illegible]	[illegible]	[illegible]								
284	1	7.09	0.22	4.9	Bav	18.70	41.8	7.69	0.02	1.13	1.67	1.40	1.01	0.09	0.00342	0.04650	0.00	[illegible]
284	4	7.44	0.20	4.9	Bav	14.00	3.4	[illegible]	[illegible]	[illegible]	[illegible]							
284	7	7.15	0.15	9.0	Sea	9.80	45.8	7.98	0.02	0.85	1.29	1.19	0.59	0.20	0.00433	0.02618	0.00	-0.0037
284	10	6.74	0.12	6.2	Sea	30.60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
284	13	7.02	0.14	6.7	Bav	27.00	89.5	6.54	0.02	1.06	1.46	1.17	1.27	0.03	0.00258	0.04065	0.00	-0.0024
284	16	7.47	0.22	5.6	Bav	18.20	7.7	[illegible]	[illegible]	[illegible]	[illegible]							
284	19	7.25	0.16	6.0	Bav	19.30	88.8	6.95	0.02	0.88	1.30	1.18	0.97	0.05	0.00292	0.02793	0.00	-0.0035
284	22	6.66	0.10	12.5	Sea	26.70	11.0	[illegible]	[illegible]	[illegible]	[illegible]							
285	1	6.88	0.14	8.7	Sea	20.60	82.0	7.53	0.02	0.95	1.37	1.18	1.04	0.05	0.00296	0.03314	0.00	-0.0030
285	4	7.45	0.18	7.2	Sea	27.50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
285	7	7.33	0.16	7.4	Sea	29.80	70.8	7.48	0.02	1.29	1.78	1.32	1.45	0.04	0.00277	0.06046	0.00	-0.0006
285	10	6.69	0.14	7.6	Sea	22.90	15.0	[illegible]	[illegible]									
285	13	6.69	0.16	4.6	Bav	22.60	62.6	5.46	0.02	1.04	1.48	1.14	1.12	0.05	0.00285	0.03904	0.00	-0.0025
285	16	7.32	0.27	5.9	Bav	28.40	9.8	11.07	0.33	[illegible]	[illegible]	[illegible]						
285	19	7.32	0.18	9.7	Sea	27.90	61.8	9.46	0.47	1.36	3.71	3.24	2.28	1.13	0.00837	0.06765	14.16	0.0001
285	22	6.65	0.14	10.9	Sea	28.90	7.6	7.63	0.42	1.46	3.58	2.74	2.31	1.01	0.00795	0.07716	12.53	0.0009
286	1	6.63	0.10	9.3	Sea	33.80	62.7	5.50	0.27	1.36	2.85	2.04	2.31	0.43	0.00567	0.06762	7.94	0.0001
286	4	7.36	0.19	6.8	Sea	23.80	30.9	8.43	0.02	1.33	1.89	1.45	1.26	0.08	0.00331	0.06473	0.00	-0.0002
286	7	7.45	0.19	7.9	Sea	13.50	61.6	8.98	0.02	0.97	1.47	1.34	0.78	0.14	0.00392	0.03415	0.00	-0.0030
286	10	6.78	0.13	10.0	Sea	28.10	20.1	7.32	0.38	1.40	3.40	2.63	2.19	0.89	0.00756	0.07152	11.26	0.0004
286	13	6.51	0.14	6.5	Bav	37.90	41.1	6.83	0.21	1.66	3.46	2.48	2.57	0.41	0.00558	0.10057	6.33	0.0030
286	16	7.13	0.19	7.2	Sea	27.30	29.2	9.16	0.33	1.49	3.76	3.16	2.14	0.91	0.00761	0.08053	9.88	0.0012
286	19	7.39	0.15	7.4	Sea	22.80	53.7	7.11	0.02	1.14	1.61	1.24	1.17	0.06	0.00307	0.04756	0.00	-0.0017
286	22	6.79	0.12	9.0	Sea	27.10	26.9	6.55	0.02	1.32	1.81	1.21	1.37	0.06	0.00300	0.06312	0.00	-0.0003
287	1	6.53	0.06	7.6	Sea	35.90	40.8	3.22	0.13	1.40	2.47	1.34	2.15	0.19	0.00425	0.07134	3.77	0.0004
287	4	7.24	0.17	6.7	Sea	32.40	17.5	7.78	0.25	1.60	3.60	2.76	2.35	0.60	0.00643	0.09304	7.52	0.0023
287	7	7.62	0.12	6.7	Bav	39.20	32.5	5.39	0.17	1.65	3.19	2.05	2.53	0.31	0.00501	0.09913	5.14	0.0029
287	10	7.08	0.14	10.9	Sea	30.00	73.2	7.30	0.02	1.26	1.70	1.22	1.45	0.04	0.00270	0.05740	0.00	-0.0009
287	13	6.52	0.09	10.9	Sea	37.10	26.4	5.22	0.28	1.57	3.24	2.02	2.59	0.49	0.00594	0.08919	8.33	0.0020
287	16	6.95	0.17	9.7	Sea	23.60	69.4	8.86	0.02	1.17	1.65	1.35	1.21	0.06	0.00309	0.04951	0.00	-0.0016

287	19	7.47	0.15	9.3	Sea	28.60	21.5	7.74	0.36	1.44	3.51	2.75	2.23	0.89	0.00753	0.07594	10.90	0.0008
287	22	7.00	0.14	11.4	Sea	21.90	56.5	7.68	0.02	1.11	1.55	1.20	1.13	0.07	0.00314	0.04487	0.00	-0.0020
288	1	6.46	0.07	10.4	Sea	39.30	28.4	4.25	0.22	1.58	3.06	1.72	2.59	0.34	0.00522	0.09136	6.48	0.0022
288	4	6.98	0.14	8.7	Sea	26.00	51.0	7.10	0.02	1.24	1.72	1.24	1.31	0.05	0.00297	0.05615	0.00	-0.0010
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14.4	6.28	0.19	1.61	3.30	2.31	2.38	0.40	0.00553	0.09391	5.76	0.0024
288	10	7.31	0.13	10.4	Sea	30.20	78.3	6.79	0.02	1.22	1.64	1.17	1.43	0.03	0.00261	0.05371	0.00	-0.0012
288	13	6.56	0.11	10.0	Sea	35.20	8.8	6.24	0.31	1.59	3.46	2.33	2.56	0.61	0.00647	0.09160	9.14	0.0022
288	16	6.74	0.10	8.4	Sea	29.90	73.5	5.14	0.02	1.18	1.58	1.03	1.40	0.03	0.00255	0.05047	0.00	-0.0015
288	19	7.43	0.18	7.9	Sea	27.50	13.6	8.47	0.34	1.48	3.65	2.96	2.15	0.89	0.00756	0.07926	10.01	0.0011
288	22	7.22	0.16	8.7	Sea	21.70	88.3	7.91	0.02	0.96	1.38	1.21	1.08	0.05	0.00287	0.03361	0.00	-0.0030
289	1	6.55	0.08	10.4	Sea	29.90	8.7	4.72	0.02	1.32	1.77	1.00	1.46	0.04	0.00278	0.06320	0.00	-0.0003
289	4	6.77	0.12	7.9	Sea	27.70	79.8	6.00	0.02	1.11	1.51	1.11	1.31	0.03	0.00260	0.04484	0.00	-0.0020
289	7	7.60	0.16	6.2	Sea	39.90	4.6	6.54	0.19	1.79	3.60	2.42	2.67	0.38	0.00541	0.11632	5.61	0.0044
289	10	7.54	0.12	9.3	Sea	42.00	56.0	5.83	0.26	1.68	3.39	2.20	2.84	0.41	0.00554	0.10220	7.75	0.0032
289	13	6.74	0.14	10.0	Sea	26.00	35.4	7.51	0.02	1.31	1.81	1.28	1.34	0.06	0.00310	0.06249	0.00	-0.0004
289	16	6.60	0.08	4.5	Bav	27.90	47.0	2.60	0.02	1.10	1.47	0.79	1.30	0.03	0.00252	0.04390	0.00	-0.0021
289	19	7.25	0.21	4.4	Bav	26.80	10.0	6.26	0.02	1.36	1.91	1.34	1.36	0.06	0.00303	0.06682	0.00	-0.0000
289	22	7.31	0.16	11.4	Sea	21.70	56.4	8.77	0.02	1.16	1.64	1.31	1.15	0.08	0.00328	0.04922	0.00	-0.0016
290	1	6.62	0.09	10.0	Sea	30.20	2.5	5.10	0.02	1.35	1.82	1.06	1.49	0.04	0.00282	0.06675	0.00	-0.0000
290	4	6.53	0.12	5.1	Bav	34.80	50.2	4.67	0.12	1.43	2.62	1.77	2.11	0.20	0.00438	0.07387	3.60	0.0006
290	7	7.30	0.17	6.3	Sea	32.50	9.7	7.19	0.22	1.58	3.44	2.58	2.29	0.52	0.00606	0.09066	6.64	0.0021
290	10	7.51	0.14	10.0	Sea	33.80	39.2	6.93	0.35	1.52	3.46	2.52	2.51	0.69	0.00680	0.08396	10.33	0.0015

Literature Cited

ABOU-SEIDA, M.M. 1965. Bedload function due to wave action. Rep. HEL-2-11, Hydraul. Eng., Univ. Calif. 78p.

BOESCH, D.F. 1974. Diversity, stability, and response to human disturbance in estuarine ecosystems, p.109-114. *In* Proc. First Int. Cong. of Ecol. Wageningen, The Netherlands: Pudoc.

BOON, J.D., S.M.KIMBALL, K.D.SUH, AND D.A.HEPWORTH. 1990. Chesapeake Bay Wave Climate Thimble Shoals wave station, Report and Summary of wave observations September 27, 1988 through October 17, 1989. Data Report #32, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary, Gloucester Point, Virginia. 38p. plus appendix.

BOYD, M.G., R.T.SAUCIER, J.W.KEELEY, R.L.MONTGOMERY, R.D.BROWN, D.B.MATHIS, AND C.J.GUICE. 1972. Disposal of dredge spoil: Problem Identification and Assessment and Research Program Development. U.S. Army Waterways Experiment Station, Vicksburg, H-72-8. 121p.

CHRISS, T.M., AND D.R.CALDWELL. 1982. Evidence for the influence of form drag on bottom boundary layer flows. J. Geophys. Res. 87: 4148-4154.

DIAZ, R.J., L.C.SCHAFFNER, R.J.BYRNE, AND R.A.GAMMISCH. 1985. Baltimore Harbor and channels aquatic benthos investigations. Final Report to Baltimore Dist., U.S. Army Corps of Engineers. 255p.

DRAKE, D.E., AND D.A.CACCHIONE. 1989. Estimates of suspended sediment reference concentration (C_a) and resuspension coefficient (δ_0) from near-bottom observations on the California shelf. Continental Shelf Research. 9: 51-64.

DYER, K.R. 1986. Coastal and Estuarine Sediment Dynamics. Wiley-Interscience. 342p.

GRANT, W.D. AND O.S.MADSEN. 1979. Combined wave and current interaction with a rough bottom. J. Geophys. Res. 84: 1797-1808.

-------,-------. 1982. Movable bed roughness in unsteady oscillatory flow. J. Geophys. Res. 87: 469-481.

-------,-------. 1986. The continental shelf bottom boundary layer. Ann. Rev. Fluid Mech. 18: 265-305.

GROSS, M.G., W.R.TAYLOR, R.C.WHALEY, E.O.HARTWIG, AND W.B.CRONIN. 1976. Environmental effects of dredging and dredged material disposal, approaches to Chesapeake and Delaware Canal, northern Chesapeake Bay. Chesapeake Bay Institute report to Maryland Department of Natural Resources. 87p.

-------, AND W.B.CRONIN. 1979. Dredging and disposal in Chesapeake Bay, 1975 - 2025, p.131-145. *In* H.D. Palmer and M.G. Gross [eds.], Ocean Dumping and Marine Pollution. Dowden, Hutchison & Ross, Inc.

-------, AND H.D.PALMER. 1979. Waste disposal and dredging activities, p.1-7. *In* H.D. Palmer and M.G. Gross [eds.], Ocean Dumping and Marine Pollution. Dowden, Hutchison & Ross, Inc.

HERBICH, J.B. 1975. Coastal and Deep Ocean Dredging, p.519-534. Gulf Publishing Company, Houston, Texas.

HOBBS, C.H., R.J.BYRNE, AND R.A.GAMMISCH. 1982. Inventory of sand resources in the southern portion of Chesapeake Bay. Final Report to Coastal Erosion Abatement Commission, Commonwealth of Virginia. 184p. plus appendices.

-------, AND L.C.SCHAFFNER. Geological and benthic evaluation of sand resources in the lower Chesapeake Bay Report 2: Tail of the Horseshoe. Final Report to the Council on the Environment, Commonwealth of Virginia. 184p. plus appendices.

HUNTLEY, D.A. 1988. A modified inertial dissipation method for estimating seabed stresses at low Reynolds numbers, with application to wave/current boundary layer measurements. J. Phys. Oceanogr. **18**: 339-346.

JUMARS, P.A. AND K.BANSE. 1989. Benthos and its interaction with bottom boundary processes, p.349-365. *In* M.R. Landry and B.M. Hickey [eds.], Coastal Oceanography of Washington and Oregon. Elsevier, Amsterdam.

KACHEL, N.B. AND J.D. SMITH. 1989. Sediment transport and deposition on the Washington continental shelf, p.287-348. *In* M.R. Landry and B.M. Hickey [eds.], Coastal Oceanography of Washington and Oregon. Elsevier, Amsterdam.

KALKANIS, G. 1964. Transportation of bed material due to wave action. U.S. Army Corps Eng. Tech. Mem. No. 2.

KAPLAN, E.H., J.R.WELKER, M.G.KRAUS, AND S.MCCOURT. 1975. Some effects of hydraulic dredging and coastal development in Boca Ciega Bay, Florida. Fishery Bull. Fish. Wildl. Serv. U.S. **67**: 213-241.

KESTER, D.R., B.H.KETCHUM, I.W.DUEDALL, AND P.K.PARK. 1983. The problem of dredged material disposal, p.3-27. *In* D.R.Kester, B.H.Ketchum, I.W.Duedall, and P.K.Park [eds.], Wastes in the Ocean: Volume 2. John Wiley & Sons, Inc.

KIM, S.C. 1990. Inner continental shelf benthic boundary layer dynamics and suspended sediment transport. Ph.D. Dissertation. School of Marine Science, The College of William and Mary in Virginia. 158p.

KIMBALL, S.M., L.C.SCHAFFNER, AND C.H.HOBBS. 1989. Geotechnical and benthic evaluation of sand resources in the lower Chesapeake Bay Report 1: Thimble Shoal. Final Report to the City of Hampton, Virginia, and the Council on the Environment. The College of William and Mary, Virginia Institute of Marine Science. 46p. plus appendices.

KOBAYASHI, N. 1979. Turbulent flows over a wavy boundary and formation of bed forms in erodible channels. Ph.D. Thesis. Mass. Inst. of Technol., Cambridge, Mass.

LEE, G.F. 1976. Dredged material research problems and progress. Environ. Sci. Technol. **10**: 334-338.

MADSEN, O.S. AND W.D. GRANT. 1976. Sediment transport in the coastal environment. Ralph M. Parsons Laboratory Report No. 209. MIT. 105p.

NICHOLS, M. 1979. The problem of misplaced sediment, p.147-161. *In* H.D.Palmer and M.G.Gross [eds.], Ocean Dumping and Marine Pollution. Dowden, Hutchison & Ross, Inc.

-------. 1983. What are the best guidelines for dredging and placement of dredged material? p.50-62. *In* L.E. Cronin [ed.], Ten Critical Questions for Chesapeake Bay in Research and Related Matters. Chesapeake Research Consortium Publication.

-------, R.J.DIAZ, AND L.C.SCHAFFNER. 1990. Effects of Hopper dredging and sediment dispersion, Chesapeake Bay. Environ. Geol. Water Sci. **15**: 31-43.

NIEDORODA, A.W., D.J.P.SWIFT, AND J.A.THORNE. 1989. Modeling shelf storm beds: controls of bed thickness and bedding sequence. Proc., GCSSEPM Foundation Seventh Annual Research Conference. p.15-38.

NIELSON, P. 1982. Explicit formulae for practical wave calculations. *In* Coastal Engineering **6**: 389-398. Elsevier, Amsterdam.

-------. 1986. Local approximations: a new way of dealing with irregular waves. ASCE Proceedings, 20th International Conference on Coastal Engineering, Taipei, Taiwan, pp. 633-646.

-------. 1989. Analysis of natural waves by local approximations. ASCE, J. Waterway, Port. Coastal and Ocean Engineering. 115:384-396.

-------. 1981. Dynamics and Geometry of wave-generated ripples. J. Geophys. Res. **86**: 6467-6472.

NOWELL, A.R. 1983. The benthic boundary layer and sediment transport. Review of Geophysics and Space Physics. **21**: 1181-1192.

ODUM, W.E. 1970. Insidious alteration of the estuarine environment. Trans. Am. Fish. Soc. **99**: 836-847.

RHOADS, D.C. 1974. Organism-sediment relations on the muddy sea floor. Oceanogr. Mar. Biol. Ann. Rev. **12**: 263-300.

-------, R.C.ALLER, AND M.B.GOLDHABER. 1977. The influence of colonizing benthos on physical properties and chemical diagenesis of the estuarine seafloor, p.113-138. *In* B.C.Coull [ed.], Ecology of Marine Benthos. University of South Carolina Press.

-------, P.L.MCCALL, AND J.Y.YINGST. 1978. Disturbance and production on the estuarine seafloor. Amer. Scientist. **66**: 577-586.

-------, AND L.BOYER. 1982. The effects of marine benthos on physical properties of sediments: a successional perspective, ch.3. *In* P.L.McCall and M.J.S.Tevesz [eds.], Animal-Sediment Relations: The biogenic alteration of sediments. Plenum Press.

ROSEN, P.S. 1976. The morphology and processes of the Virginia Chesapeake Bay shoreline. Ph.D. Dissertation. School of Marine Science, The College of William and Mary in Virginia. 313p.

SCHUBEL, J.R. AND W.M.WISE. Questions about Dredging and Dredged Material Disposal in the Chesapeake Bay. Marine Sciences Research Center, State University of New York, Special Rept. 20. 143p.

SMITH, D.D. 1976. New federal regulations for dredged and fill material. Environ. Sci. Technol. **10**: 328-333.

SMITH, J.D. AND S.R.MCLEAN. 1977. Boundary layer adjustments to bottom topography and suspended sediment, p.123-151. *In* J.C.J.Nihoul [ed.], Bottom Turbulence. Elsevier, New York.

SOULSBY, R.L. 1983. The bottom boundary layer of shelf seas, p.189-266. *In* B.John [ed.], Physical Oceanography of Coastal and Shelf Seas. Elsevier, Amsterdam.

-------, AND K.R.DYER. 1981. The form of the near-bed velocity profile in a tidally accelerating flow. J. Geophys. Res. **86**: 8067-8074.

STERNBERG, R.W., J.S.CREAGER, J.JOHNSON, AND W.GLASSLEY. 1979. Stability of dredged material deposited seaward of the Columbia River mouth, p.17-49. *In* H.D.Palmer and M.G.Gross [eds.], Ocean Dumping and Marine Pollution. Dowden, Hutchison & Ross, Inc.

TAYLOR, J.L. AND C.H.SALOMAN. 1968. Some effects of hydraulic dredging and coastal development in Boca Ciega Bay, Florida. U.S. Fish. & Wildl. Serv. Fishery Bull. **67**: 213-241.

VINCENT, C.E., R.A.YOUNG, AND D.J.P.SWIFT. 1981. Bed-load transport under waves and currents, p.71-80. *In* Marine Geology **39**: 71-80. Elsevier, Amsterdam.

-------, AND M.O.GREEN. 1990. Field measurements of the suspended sand concentration profiles and fluxes and of the resuspension coefficient δ_0 over a rippled bed. J. Geophys. Res. **95**: 11,591-11,601.

WILLIAMS, S.J. 1979. Geologic effects of ocean dumping on the New York Bight inner shelf, p.51-72. *In* H.D.Palmer and M.G.Gross [eds.], Ocean Dumping and Marine Pollution. Dowden, Hutchison & Ross, Inc.

WRIGHT, L.D. 1989. Benthic boundary layers of estuarine and coastal environments. Reviews in Aquatic Sciences. **1**: 75-95.

-------, D.B.PRIOR, C.H.HOBBS, R.J.BYRNE, J.D.BOON, L.C.SCHAFFNER, AND M.O.GREEN. 1987. Spacial variability of bottom types in the lower Chesapeake Bay and adjoining estuaries and inner shelf. Est. Coast. Shelf. Sci. **24**: 765-784.

-------, J.D.BOON, J.P.-Y.MAA, AND S.M.KIMBALL. 1990. Predicting the impacts of sea floor and bay floor mining and material disposal: modeling bed mobility and mixing. Unpublished proposal.

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