THE SEASONAL OSCILLATION IN SEA LEVEL[1]

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ABSTRACT

On the basis of all available tide gauge records, bathythermograms, and Nansen bottle casts, we have compiled, on a global scale, monthly departures of *recorded* and *steric* sea levels from their annual means. The steric fluctuation is defined in terms of the seasonal fluctuation in specific volume. The results are given in the appendices and in three charts, together with error estimates. In general, the departures are comfortably above the uncertainties introduced by year to year variations and by the effects of local topography.

Recorded and steric departures agree remarkably well in low and temperate latitudes (conditions are *isostatic*). In these regions the steric levels are associated largely with temperature fluctuations in the upper 100 m. In high latitudes conditions are indeterminate.

Pronounced semiannual fluctuations are found along the west coast of South Africa, in Indonesia, in corresponding regions of the Labrador and Oyashio currents, and in the Gulf of Mexico and adjoining Gulf Stream stations (but not in the Kuroshio!). Elsewhere the oscillations are largely annual in character, with low sea level in each hemisphere during its spring and with high level during the fall. Recorded amplitudes vary from a few centimeters in the tropics to a few decimeters at higher latitudes; they exceed one meter in the Bay of Bengal. Atmospheric pressure effects and long period astronomic tides account for only a small part of the recorded fluctuations.

1. INTRODUCTION

The noteworthy compilation of 10^5 mean monthly heights of sea level from nearly all existing tide gauge stations, prepared by Proudman under the auspices of the Union Géodésique et Géophysique Internationale (UGGI, 1940, 1950), makes it possible to view the seasonal oscillation in sea level on a global scale. Numerous investigations have dealt with single stations or with small groups of stations.

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But it appears to be typical of meteorological and oceanographic phenomena that the larger the area under consideration the simpler they are. We believe, therefore, that an investigation on a global scale, although offhand more ambitious, is actually less so. It certainly is the more rewarding at this time.

For comparison we have also computed oscillations in the height of the sea surface arising from the seasonal variation in specific volume. These are called *steric* oscillations.[2] The steric sea level is high when the water is warm, low when it is cold. Conversely, a high steric level corresponds to a low value of salinity. The source of data consists of bathythermograms and, to a much lesser extent, Nansen bottle casts. For all oceans, information is now on file at the U. S. Navy Hydrographic Office for 5×10^5 bathythermograph casts and for 2×10^5 Nansen bottle casts. Although these numbers are impressive, the observations are so scattered in time and place that the seasonal changes in specific volume could be computed for only 69 areas, barely enough to indicate some global characteristics.

A comparison of recorded and steric fluctuations in sea level puts the problem on a much more definitive basis than would be possible with either set of data by itself. In some regions the two fluctuations resemble one another more closely (correlation 0.90 off Hawaii and Japan, 0.85 off Cape Hatteras) than any other sets of independent oceanographic observations known to us.

During the last few years some progress has been made in accounting for the mean ocean circulation in terms of the distribution of wind stress over the seas. The next problem is to account for departures from the mean circulation. This is much more difficult. The observed seasonal variations in sea level will have to provide much of the necessary empirical guidance for such an undertaking. We therefore present the following description even though we have not been able to explain it. A complete explanation probably involves the solution of most of the important unsolved problems in dynamic oceanography.

2. THE RECORDED SEA LEVEL

2.1 *Sources of tide gauge data.* The principal sources are the two publications prepared by Proudman and others (UGGI, 1940, 1950). Additional data were obtained from the U. S. Coast and Geodetic

[2] The steric oscillations are nearly equal in magnitude to those in dynamic height, so that for traditional reasons the term *dynamic oscillations* would appear to be appropriate. But dynamic height has dimensions of work rather than length, and dynamic oscillation seems to us a poor adaptation of a poor term.

Survey, the Geographical Survey Institute of Japan (1950) and a few other sources. A footnote in Appendix I indicates if part or all of the data for a station are from a source other than the two UGGI publications. Some published stations were omitted because the data were too incomplete. Here it must be admitted that our standards were more exacting where more observations were available. For example, the Arctic and Antarctic stations were included in spite of the fact that the observations were scanty.

Appendix I lists the latitude and longitude of each station as given in the above references. The inclusive dates for the calendar years for which data are available are also given. When two calendar years represent data for 13 months or less, the inclusive months are indicated. The figure in parentheses following the dates indicates the number of years for which data are incomplete. The next column gives the total number of calendar years represented, except in cases where data for 13 months or less were available. This is considered as one year even though the observations may have extended through two calendar years. For example:

Years	*Total years*	
1931–39 (1)	9	Data from 1931 (incl) to 1939 (incl) but one year incomplete. Hence 9 years of data.
1935–41, 1943–46 (1)	11	Data from 1935 (incl) to 1941 (incl) and 1943 (incl) to 1946 (incl), with one year incomplete for latter period. Hence 11 years of data for both periods.
June 1941–May 1942 (2)	1	Data from June 1941 (incl) to May 1942 (incl), both years incomplete. Hence *one* total year by above rule.

2.2 *Normal monthly values.* The standard procedure is to take hourly readings of tide records. The published monthly value for, say January 1950, is a straight average of all hourly readings during January 1950. The figure appearing in the January column of Appendix I represents an average value for all Januaries for which sea level was reported at the particular station under consideration. Similar calculations of "normal monthly" values were made for all other months of the year. The mean value of the monthly means has been subtracted, so that the numbers in the appendix represent departures from an annual mean.

For stations with data for only part of a year among a group of stations with data for all 12 months, the reference level was adjusted so that the mean value of the available monthly means equalled the mean departure for the same months in the remaining stations of the group.

2.3 *Group averages.* The seasonal curve was drawn for each station. *Adjoining stations that showed similar behavior* were then combined into groups. Altogether there are:

419 stations
92 station groups
an average of 4.6 stations per group
an average of 20.6 years of record per station
longest record (133 years) is from Swinemunde, Germany.

The problem as to how individual stations should be combined to form group averages requires consideration. There are two obvious procedures. We could form an *average of stations,* assigning to each station equal weight; or we could form an *average of years,* lumping all data within the group together without regard to station. The former procedure would come close to giving us the geographic average we really want, except that the stations are never distributed too well throughout the area under consideration. The latter procedure leads to a minimum standard deviation in the group average.

The two procedures outlined above correspond to weighting each station average by

$$1 \text{ (or } n^0) , \qquad n \text{ (or } n^1) \tag{1}$$

respectively, where n is number of years of record. We have chosen a *root-weighted* average as a compromise.[3] Each station is weighted by the nearest integral number to

$$n^{\frac{1}{2}} . \tag{2}$$

In this way the group averages in Charts 1 to 3 and in Appendix I have been computed.

2.4 *Discussion of errors.* The monthly departures for each group (Charts 1–3) are estimates of normal seasonal conditions in the general area occupied by the stations in the group. In regions where the records are short and the stations few, there is doubt regarding the significance of secondary peaks or even of principal features. An estimate of the uncertainty of the plotted normal departures is therefore essential. It should be emphasized, of course, that the changes from year to year which give rise to this uncertainty are themselves of interest. But this is another story.

2.41 *Time variance.* The seasonal departures differ considerably from one year to the next, due largely to anomalies in weather (atmos-

[3] A better procedure is to use the "semiweighted" mean (Cochran, 1954), which Mr. Theodore Widrig called to our attention after the computations had been nearly completed.

phere and ocean). The fact that neighboring stations show similar anomalies in a given year eliminates observational error as an important factor. The compilation in Table I gives the standard deviation, ε, of a monthly departure from the annual average, taken year by year. The first line, for example, contains the standard deviation of the following 45 numbers: Göteborg, Jan. 1902 minus annual 1902, Jan. 1903 minus annual 1903, ..., Jan. 1946 minus annual 1946. In Table I we have selected stations with many years of record in both hemispheres and all major oceans, and, except in four instances, we have ignored the first ten years to give the station a chance to "settle down."

TABLE I. STANDARD DEVIATION PER YEAR, ϵ, FOR STATED MONTHS

Group	*Station*	*Month*	*Years*	*n*	ϵ*(cm)*
3	Göteborg	Jan.	1902–46	45	11.6
3	Göteborg	Feb.	1902–46	45	10.9
3	Göteborg	April	1902–46	45	7.1
3	Göteborg	July	1902–46	45	5.2
3	Göteborg	Oct.	1902–46	45	11.1
21	La Plata*	April	1916–34	19	8.0
21	Buenos Aires	April	1915–46	31	6.3
21	Puerto de Colonia*	April	1938–46	9	8.2
21	Montevideo*	April	1938–46	9	6.2
21	Puerto de Punta del Este*	April	1938–45	8	9.3
8	Brest	April	1874–1943	70	6.2
30	Baltimore	April	1912–46	35	4.2
44	San Francisco	April	1907–46	40	5.2
49	Honolulu	April	1915–46	32	5.5
69	Hososima	April	1910–49	40	3.4
83	Bombay	April	1888–1946	59	4.3

* *All* years on record were used.

At Göteborg the standard deviation is small in spring and summer, large in fall and winter. For Group 21, which is a typical group according to the statistical summary in Section 2.3, the standard deviation for April varies from 6.2 at Montevideo to 9.3 at Puerto de Punta. Applying Bartlett's χ^2-test (Cochran, 1954), we obtain $\chi^2 = 35$ for Göteborg, and $\chi^2 = 2.9$ for Group 21, both with four degrees of freedom. The 5% significance level is at $\chi^2 = 9.5$. Thus the seasonal variation in ε at Göteborg is significant, whereas the variation between the different stations in Group 21 is probably not.

The mean April deviation for all stations in Table I is 6.15 cm.

A value of

$$\varepsilon = 6 \text{ cm} \tag{3}$$

will be taken as representative of the standard deviation of a monthly value for all months and all stations. The standard deviation of the normal monthly mean value based on n years of record is therefore

$$\varepsilon\, n^{-\frac{1}{2}} . \tag{4}$$

Since the annual variation in sea level has a double amplitude of the order of 20 cms, something like a decade of record is required to suppress the "noise level" at any one station to 10 per cent of the signal strength.

It can be verified that the standard deviation of the root-weighted group average is

$$\frac{1}{m^{\frac{1}{2}} < n^{\frac{1}{2}} >} \varepsilon = k\varepsilon , \tag{5}$$

where m is the number of stations comprising the group and where $< n^{\frac{1}{2}} >$ is the average value of $n^{\frac{1}{2}}$ for the m stations. Thus, for a group of four stations with records of 1, 4, 9, 16 years respectively, we have

$$k = \frac{1}{2\,(1 + 2 + 3 + 4)} = 0.2 .$$

2.42 *Geographic variance.* An additional uncertainty arises from the location of stations. Suppose that sea level varies erratically from bay to bay, from headland to headland. Then if each station in a group had been located one mile from its actual location, the resulting group average would have been different. Even if all records were exceedingly long so that the time-variance at each station was negligible, still there would be uncertainty as to the extent to which the computed group average is representative of the general area under consideration.

Two extreme cases are here considered. If departures at neighboring stations show no correlation, i.e., the departures are *incoherent*, then the total variance is the sum of the time variance and the geographic variance. If, however, the departures are *coherent* and the stations uniformly spaced, then the geographic variance does not contribute to the uncertainty of the group average. As an example of this latter case, consider a linear rise in sea level from station to station along a coastline. Then the station average gives the precise value for *average* sea level in the area. Shifting all the stations, or expanding the distance between them, would hardly affect the computed average. From the standpoint of variance the incoherent case may become the coherent case if the station spacing is sufficiently reduced.

The geographic variance has been estimated as follows. Let δ_i^2 be the mean square deviation of the 12 normal monthly values at the i^{th} station from the corresponding group averages. The root-weighted variance for all m stations in a group is

$$\delta^2 = \frac{\sum_{i=1}^{m} n_i^{\frac{1}{2}} \delta_i^2}{\sum_{i=1}^{m} n_i^{\frac{1}{2}}}.$$

This is taken as the geographic variance per station. The variance of the group average is then $m^{-1}\delta^2$.

In Appendix I the value of k precedes the uncorrected averages for each group, and $m^{-\frac{1}{2}}\delta$ (in cm) precedes the corrected averages. On Charts 1–3 the numbers following each group number give (in cm)

$$k\epsilon \text{ and } \sqrt{k^2 \epsilon^2 + m^{-1} \delta^2} \text{ for } \epsilon = 6.0 \text{ cm} . \quad (6)$$

These are low and high estimates of the standard deviation, corresponding (more or less) to coherent and incoherent groups of stations. But there are some difficulties inherent in this procedure, and it is not clear where the best estimate of variance lies.

As an example, consider the three neighboring groups

No.	*Locality*	*k*	$k\epsilon$ *cm*	$m^{-\frac{1}{2}}\delta$ *cm*	*Limits of standard deviation* *cm*
7	North Sea (South)	0.04	0.24	0.40	0.2—0.4
8	English Channel	0.14	0.84	1.93	0.8—2.1
9	Bay of Biscay	0.36	2.16	2.11	2.2—3.0

The increasing irregularity of the curves toward the south, as seen on Chart 1, is related to the decrease in the number of observations.

2.43 *Suppression of the astronomic tides.* Short period astronomic tides are larger than the seasonal variation. However, the combination of hourly values into monthly averages for a given year and of corresponding values for several years into the "normal" monthly values suppresses the short astronomic tides. But the elimination is not complete. We shall consider briefly the extent to which spurious fluctuations in the mean monthly values can be attributed to the tidal residues.[4]

[4] We are indebted for this method of treatment to Mr. Gordon Groves.

Let t designate time in mean solar hours and $y(t + 1^h)$, $y(t + 2^h)$, . . . $y(t + i^h)$, . . . $y(t + N^h)$ the tidal heights at $(t + 1^h)$, $(t + 2^h)$, . . . $(t + i^h)$, . . . $(t + N^h)$. This includes all hourly values from the first to last ($N'th$) hourly tidal height during the month.

For a pure harmonic constituent of speed σ(in hours^{-1}) and of unit amplitude,

$$y(t) = \cos(\sigma t - \eta) . \tag{7}$$

The monthly average is then

$$(1/N) \sum_{i=1}^{N} y(t + i) = f \cos(\sigma t - \eta + \tfrac{1}{2}\sigma N + \tfrac{1}{2}\sigma) , \tag{8}$$

where

$$f = N^{-1} \csc \tfrac{1}{2}\sigma \sin \tfrac{1}{2}\sigma N . \tag{9}$$

Table II gives the values of f for the principal tidal constituents for months of all possible lengths.

TABLE II. ATTENUATION FACTOR f

Constituent	*28 days*	*29 days*	*30 days*	*31 days*
M_2	.0019	.0006	−.0006	−.0016
S_2	.0000	.0000	.0000	.0000
N_2	−.0016	.0003	.0021	.0035
K_2	.0027	.0027	.0026	.0026
K_1	.0027	−.0027	.0027	−.0027
O_1	.0010	.0016	−.0040	.0060
P_1	−.0027	.0027	−.0027	.0027
Mf	.0242	.0564	.0837	.1050
MSf	−.0537	−.0183	.0156	.0466
Ssa	.9618	.9591	.9562	.9533
Sa	.9903	.9897	.9890	.9882

The contribution from any one semidiurnal or diurnal species is less than 1% of its amplitude. The total contribution depends on the actual amplitudes and relative phases. If all constituents are in phase in the monthly average, the total contribution to the monthly mean may reach as much as 1 cm at stations with extreme tides. On the average the contribution will be of the order of a millimeter.

The effect of the fortnightly tides is larger. The Mf constituent has an amplitude of the order of 5 cm, and the contribution to the monthly means will be of the order of several millimeters. At stations with large shallow water effects, the distortion of the primary constituents, M_2 and S_2, gives rise to a fortnightly constituent with the same period as the astronomic constituent MSf. Here the contribution to the monthly means may exceed a centimeter. The semiannual and annual constituents appear in the monthly averages with nearly, but not quite, their full amplitude.

The preceding discussion refers to any particular monthly mean in a single year. Consider now the contribution of the tidal constituents to an average over n years of this monthly mean. The arguments of the lunar constituents, M_2 N_2 O_1 Mf MSf, depend on the position of the moon, and their phase in any given monthly average will not vary in a simple manner from one year to the next. The cosine in equation (7) will take up in successive years scattered values between -1 and $+1$. Though the process is not random, strictly speaking, we might expect the lunar contribution to the monthly means to be of the order of $fn^{-\frac{1}{2}}$.

On the other hand, the solar constituents, K_2 K_1 P_1, have approximately the same argument at the beginning of a given month, regardless of the year, and the contribution to any monthly mean is given by equation (8) no matter how many years of record are averaged. The value must lie between $-f$ and $+f$, and if necessary it can be computed from the known values of σ, N, and η. There is a slight attenuation because the phase varies somewhat from year to year. We can compute an upper limit to the attenuation by considering K_2, whose argument shows the greatest variation (i.e., 40°; see Schureman, 1941: table 15), and by assuming that this argument at 0000 1 Jan. is with equal frequency at the extreme values of the 40° range. Then, since amp $\frac{1}{2}$ [cos $(x + 40°)$ + cos x] = 0.94, the reduction achieved by averaging over many years is only 6%. A slightly greater reduction is achieved for February because of the leap year variation in N.

The contribution from astronomic tides to the monthly means can be summarized as follows. For short records, say n less than 10 years, the principal factor is a nearly random contribution from fortnightly tides amounting to 0.1 $n^{-\frac{1}{2}}$ to 0.5 $n^{-\frac{1}{2}}$ cm. For longer records a nearly systematic contribution from solar constituents becomes predominant, and this is nearly independent of n. A typical value for K_1 is 0.1 cm. All these values are small compared to the observed standard deviation of about $6n^{-\frac{1}{2}}$ cm (Section 2.4_1), and it may be concluded that the present method of forming straight monthly averages is adequate. It should be pointed out, however, for the benefit of future oceanographers, that after a thousand years or so better methods for eliminating the solar constituents will become worthwhile.

3. THE STERIC SEA LEVEL

Wherever observations are adequate we have attempted to compute the seasonal departures in sea level arising from seasonal departures in specific volume. The resulting "steric sea levels," summarized in Appendix II, are shown in red on Chart 1. The selection and analysis of a large part of the observations have been made possible only by the help and active participation of the U. S. Navy Hydrographic Office and the Woods Hole Oceanographic Institution.

3.1 *Sources of data.* There are three sources of data:
(1) A few *analyses of seasonal variation* in temperature (and/or salinity) are available in journals and technical reports. They will be referred to under the author's name.
(2) *Bathythermograms* on file at Woods Hole and at Scripps Institution are referred to as WHOI and SIO.
(3) *Serial hydrographic observations* were provided by the Hydrographic Office, U. S. Navy (HYDRO).

Calculations have been made for 69 areas. The information given for each area in Appendix II is illustrated by the following examples:

No.	*Locality*	*Latitude*	*Longitude*	*BTs/Mo.*	*NB*	*Principal Source*
6	Off Gibraltar	32°–37° N	010°–015° W	104[1]	0[2]	WHOI
24	Aleutian Is.	52°–53° N	179° E–180°	8	1	Pattullo (1950)
3	North Sea	55°–60° N	005°–010° E	57[1]	unk.	Dietrich (1950)
55	Kuroshio[3]	unknown		unknown		Koenuma (1939)
		34°–35° N	139°–140° E	0	118	Japanese
		37°–38° N	142°–143° E	0	216	JAP-HYDRO

All observations for No. 6 were taken off Gibraltar between 32° and 37° N and 010° and 015° W. An average of 104 bathythermograms per month were available, but according to footnote 1 (App. II) some temperatures from reversing thermometers were included. The column under *NB* (Nansen bottle) indicates that no serial Nansen bottle observations were used. According to footnote 2, salinity was deduced from a *T-S* scatter diagram. Bathythermograms on file at the Woods Hole Oceanographic Institution are the principal source of data. In No. 24, the analysis was based on an average of 8 bathythermograms per month and 1 serial Nansen bottle cast. In No. 3 the principal source is an analysis by Dietrich based on an unknown number of Nansen bottle serial observations; however, some additional data consisting largely of bathythermograms have been used. No. 55 represents a special case. Here we have combined

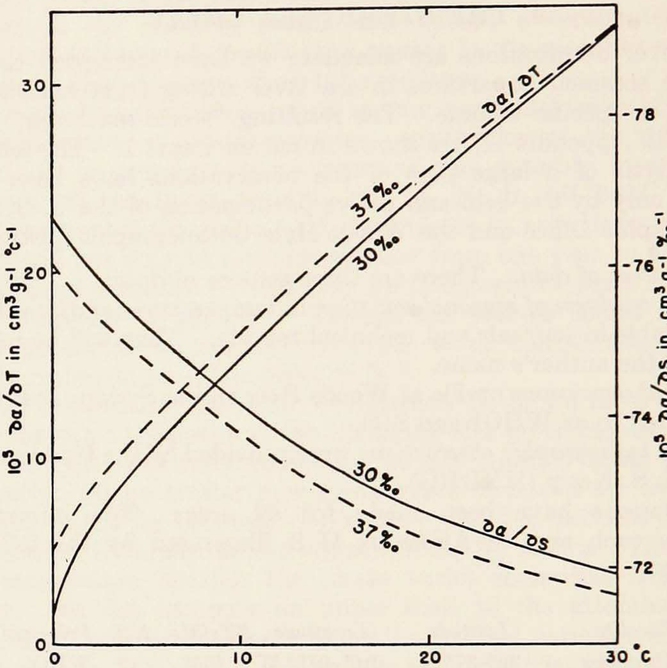

Figure 1. Thermal expansion, $\partial\alpha/\partial T$, and haline expansion, $\partial\alpha/\partial S$, of sea water at atmospheric pressure, as functions of temperature in °C for salinities $S = 30°/_{oo}$ and $37°/_{oo}$.

a temperature analysis by Koenuma with an assortment of Japanese serial observations.

3.2 *Thermal and haline effects.* From the available data we gain information concerning variations in the temperature and salinity fields with time of year at various depths (or pressures). For any depth let $\Delta T = T - \overline{T}$, $\Delta S = S - \bar{S}$ designate the monthly departures in temperature and salinity from their annual means, $\overline{T}$, $\bar{S}$. For small values of ΔT and ΔS the corresponding departure in specific volume is given by $\Delta\alpha = \alpha(T,S,p) - \alpha(\overline{T},\bar{S},p) = (\partial\alpha/\partial T)\Delta T + (\partial\alpha/\partial S)\Delta S + \ldots$, where $\partial\alpha/\partial T$ and $\partial\alpha/\partial S$ are to be evaluated at $\overline{T}$, $\bar{S}$, p. But the explicit dependence of $\partial\alpha/\partial T$, $\partial\alpha/\partial S$ on pressure can be neglected, and accordingly in all numerical work we have read $\partial\alpha/\partial T$ and $\partial\alpha/\partial S$ as functions of $\overline{T}(p)$, $\bar{S}(p)$, 0 (Fig. 1).

The "thermal" and "haline" departures are now defined by

$$z_T = g^{-1} \int_{p_a}^{p_0} (\partial\alpha/\partial T)\,\Delta T\,dp\,, \quad z_S = g^{-1} \int_{p_a}^{p_0} (\partial\alpha/\alpha S)\,\Delta S\,dp\,. \quad (10)$$

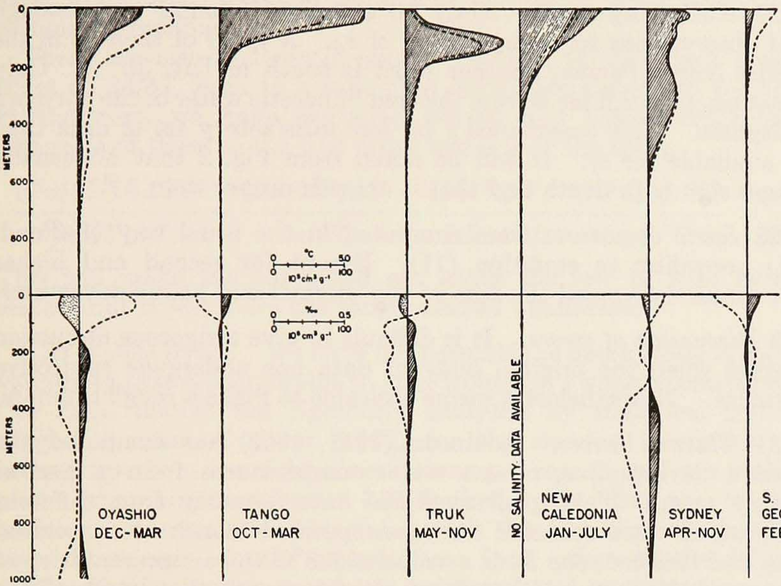

Figure 2. Top. Ranges of temperature, ΔT, in °C (dashed lines, upper scale), and the resulting ranges of specific volume, $(\partial\alpha/\partial T)\Delta T$, in cm³ g⁻¹ (solid lines, lower scale) between months of maximum and minimum steric departures. Bottom. Ranges of salinity, ΔS, in ‰ (dashed lines, upper scale), and the resulting ranges of specific volume $(\partial\alpha/\partial S)\Delta S$, in cm³ g⁻¹ (solid lines, lower scale) between months of maximum and minimum steric departures.

The steric departures equal

$$z_\alpha = g^{-1} \int_{p_a}^{p_0} \Delta\alpha \, dp \, . \tag{11}$$

Here p_a is the atmospheric pressure and p_0 the pressure to which the integration has been carried, presumably the pressure where all seasonal effects vanish.

3.21 *Thermal departures* have been computed for 69 localities. More than half of these are based on bathythermograph observations, which usually extend to only 450 feet (135 m). It was therefore necessary to augment the bathythermograph data by Nansen bottle temperature measurements and some subjective interpolation.

Fig. 2 shows some seasonal differences in ΔT and $(\partial\alpha/\partial T)\Delta T$. At most localities these quantities are large only in the upper few hundred meters or upper 10% of the sea. However, five southern hemisphere areas showed appreciable temperature variations as deep as 600 or 800 m. All of these were near the southern tips of the southern continents—Africa, South America, and Australia.

3.22 *Haline departures.* Only 30 areas were found with enough serial observations for computation of z_S. A third of these is in the western North Pacific; another third is south of Lat. 30° S. Only one satisfactory sample is from the cold Subarctic water of the northern hemisphere. This constitutes a far less satisfactory set of data than was available for z_T. It will be noted from Fig. 2 that ΔS usually changes sign with depth and that it extends deeper than ΔT.

3.23 *Steric departures* were computed in the usual way (LaFond, 1951) according to equation (11). Except for second and higher order terms they equal the sum of the thermal and haline departures.

3.3 *Discussion of errors.* It is difficult to give a rigorous discussion of errors when the original body of data has undergone subjective treatment. Nevertheless it seems desirable to make a rough estimate.

3.31 *Thermal errors.* Robinson (1951, 1952) has computed the standard deviation, s, of sea water temperatures from a normal monthly mean. Taking all available data, possibly from different years, which were collected during a specified month at a specified depth and location, she finds a value of 0.8°C to be representative of the upper 400 feet. Although we might expect that most of the variation takes place in this upper layer, let us assume this value to be representative all the way down to 400 m.

Suppose that this average is based on n' observations and that the deviations for any one bathythermogram are the same at all depths. Then the standard deviation of the mean temperature is $s(n')^{-\frac{1}{2}}$ and of the computed mean sea level departure $s\ (n')^{-\frac{1}{2}}\ (\partial\alpha/\partial T)\ h$. Typical numerical values are $s = 0.8°$ C, $n' = 25$ (the median for our data), $\partial\alpha/\partial T = 1.5 \times 10^{-4}\ \text{cm}^3\ g^{-1}\ °C^{-1}$, and $h = 400$ m. The foregoing formula then gives the value 1.0 cm.

A second estimate has been made by computing z_T for each of 100 bathythermograms taken in August 1943–48 at Weather Station "Nan," 30° N, 140° W, No. 31. The standard deviation per year is $\varepsilon' = 2.9$ cm and per five-year average $2.9 \times 5^{-\frac{1}{2}} = 1.3$ cm. The value of ε' is roughly half of ε, the value adopted in Section 2.41 as representative of the standard deviation of the recorded departures.

For the three years 1943–46 the tide gauge and steric sea level records at Hawaii overlap (recorded group 49, steric group 35). For these three years we find $\varepsilon = 2.9$ cm, $\varepsilon' = 3.5$ cm. There is no evidence here for a difference between the standard deviations of recorded and thermal departures, but obviously the data are far from conclusive. The thermal departures appear smoother on Chart 1. This is due, at least in part, to the fact that they were computed from smoothed temperature data, whereas the recorded departures are drawn through each point without smoothing.

There are also systematic errors. Neglect of the direct pressure effect on $\partial\alpha/\partial T$ leads to a computed amplitude about 5% too small. Furthermore, we have neglected second and higher order terms. The ratio of these to the first order terms is of the order

$$\frac{(\partial^2\alpha/\partial T^2)\,(\Delta T)^2}{(\partial\alpha/\partial T)\,\Delta T} = \frac{(\partial^2\alpha/\partial T^2)\,\Delta T}{\partial\alpha/\partial T} = \frac{(10^{-6}\mathrm{cm}^3\,g^{-1}\,{}^\circ\mathrm{C}^{-2})\,(1\,{}^\circ\mathrm{C})}{1.5 \times 10^{-4}\mathrm{cm}^3\,g^{-1}\,{}^\circ\mathrm{C}^{-1}} = \frac{1}{15}\,.$$

This will make the computed sea levels too low in both extreme seasons but it will leave the ranges almost unaffected.

3.32 *Haline errors.* We have not been able to find a study of salinity variability that is comparable to Mrs. Robinson's work on temperature. Our data, though not rigorously analyzed by statistical methods, suggest a value of about 0.10‰ for the standard deviation. On an average there are eight observations per month, and our estimate of the error following Section 3.31 is then 2 cm. But now there are additional uncertainties associated with the fact that the contributions from some depths cancel those from other depths (Fig. 2), so that the final value represents a difference of two uncertain quantities. Only at stations with rather large haline departures can the computed values of z_S be considered significant.

Systematic errors in haline departure are quite small. The effect of pressure on $\partial\alpha/\partial S$ again leads to a computed amplitude that is too small, but by less than 2%. The ratio of the second order to the first order term is less than 0.001.

4. ATMOSPHERIC PRESSURE

The last three lines for each group of stations in Appendix I give a correction for the isostatic yielding of the ocean surface to the fluctuating atmospheric pressure. On first consideration, the only requirement seems to be that the sea surface be depressed by 1 cm for every rise in pressure[5] by 1 mb in the general area of the group of tide stations. This has been done in previous investigations. But this procedure does not take into account a surprisingly large annual change in the mean pressure over all oceans, from 1012 mb in December to 1014 mb in July, due principally to a shift in air mass toward Siberia in winter. It is clear that no correction would be required if the annual change in pressure were uniform over all oceans.

[5] The pressure exerted by 1 cm of sea water is 1.005 mb.

Let P_g designate the mean monthly pressure in the general vicinity of the group of tide gauge stations and P_0 the mean pressure over all oceans for the same month (Table III). Then $c' = P_g - P_0$ represents the amount by which the water surface in this area is depressed relative to mean global sea level. The recorded sea level has to be

TABLE III. Example of Pressure Correction

	J	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*
P_g − 1000 mb	6.5	8.0	9.0	9.5	14.5	14.0	11.5	10.0	10.5	8.5	7.0	7.0
P_0 − 1000 mb	12.4	12.4	12.8	12.8	12.8	13.5	14.0	13.3	13.4	12.8	12.6	11.9
$P_g - P_0$	−5.9	−4.4	−3.8	−3.3	1.7	0.5	−2.5	−3.3	−2.9	−4.3	−5.6	−4.9
c (cm)	−2.7	−1.2	−0.6	−0.1	4.9	3.7	0.7	−0.1	0.3	−1.1	−2.4	−1.7

raised by this amount to correct for the effect of atmospheric pressure. Since the base level is arbitrary, it is more convenient to use the correction factor $c = c' - \overline{c'}$, whose mean annual value is zero. These four steps are illustrated in Table III. In Appendix I the last four lines for each station group designate z, $P_g - 1000$ *mb*, c, and $z + c$. The quantities z, c, and $z + c$ have a zero annual mean. The second line in Table III designates the mean pressure over all oceans, and of course it is the same for all tide groups. The average was formed on the basis of values for each 5° quadrangle between 90° N and 10° N (U. S. Department of Commerce, 1946) and for each 10° quadrangle between 10° N and 60° S (Bartholomew and Herbertson, 1899). These two references were also the source of the P_g values.

The foregoing isostatic adjustment for atmospheric pressure changes would be invalid for quick changes in pressure. There simply would not be time for the water to move. Various theoretical models yield time constants short compared to a year. Empirical evidence (to be published shortly by Mr. Gordon Groves) indicates that sea level yields virtually isostatically to atmospheric pressure disturbances with dimensions of several thousand miles and a time scale of several days. We are satisfied that the isostatic adjustment to atmospheric pressure is a suitable approximation for the annual term.

We have made no allowance for wind stress. Changes in wind accompany changes in pressure, and the wind effect is likely to be larger and opposite in sign to the pressure effect. This may account for the fact that in some cases the variation in sea level, corrected for atmospheric pressure, is actually larger than the uncorrected variation (see Section 6.6).

5. LONG PERIOD ASTRONOMIC TIDES

In this section we consider the extent to which astronomic tides of annual and semiannual period contribute to the recorded monthly departures. Rayleigh has shown (Lamb, 1932) that tides in the actual oceans[6] with periods long compared to a day have nearly the values given by the equilibrium theory. For the solar annual (Sa) and the solar semiannual (Ssa) species, these values are (Doodson and Warburg,[7] 1941)

$$z = [0.16 \cos (\odot - 282°) + 0.98 \cos 2\odot] (1 - 3 \sin^2 \phi) , \quad (12)$$

where ϕ is latitude and $\odot$ the sun's longitude (March 21: $\odot = 0, 2\pi$; June 21: $\odot = \frac{1}{2}\pi$, etc.).

The above formula must be corrected for the elastic yielding of the crust (relative to which sea level is measured) and for the gravitational attraction of the tidal bulge on itself by multiplying by a factor (Jeffreys, 1952: 204)

$$1 + k - h = 0.69 , \quad (13)$$

where k and h are "Love's numbers."[8] In addition, we must superpose a uniform tide z' over all oceans so that the total tidal volume

$$\int_{ocean} z (\odot, \phi) \, d\sigma + z' (\odot) \int_{ocean} d\sigma$$

vanishes in spite of the irregular distribution of land and sea. When this is done, the expression $(1 - 3 \sin^2 \phi)$ in equation (12) is replaced by

$$3(1 - D/C) - 3 \sin^2 \phi = 0.91 - 3 \sin^2 \phi , \quad (14)$$

where $C = \int\int \cos \phi \, d\phi d\theta = 8.79$ and $D = \int\int \cos^3 \phi \, d\phi d\theta = 6.11$ are integrals over such ranges of latitude ϕ and longitude θ as are covered by oceans. The values were obtained by Munk and Revelle (1952: 333) by numerical integration.

Applying these two factors to the above formula for the equilibrium tide gives

$$z = [0.11 \cos (\odot - 282°) + 0.68 \cos 2\odot] \, (0.91 - 3 \sin^2 \phi) . \quad (15)$$

[6] In the case of an ocean covering the entire globe, this result probably does not hold (Lamb, 1932: 362; Jeffreys, 1952: 371).

[7] The numerical results follow from equations (4.3a for sun), (4.3b), (7.10a), and Table 7.17, setting $p = 282°$ and writing $\odot$ for h.

[8] This k is used in accordance with convention. It is not the k used in other sections of this paper.

An observational test of this formula is impossible because the meteorological effects of annual and semiannual period far outweigh the astronomic effects. The only long period tide for which the astronomic factors predominate is the lunar fortnightly tide, and here at least an expression analogous to (15) agrees roughly with the results of observations. Fig. 3 shows the height of the combined annual and semiannual tides according to equation (15). The maximum tidal range is 3.2 cm between March 20 and June 21 at latitude 90°. This value is much smaller than a typical value for the recorded range.

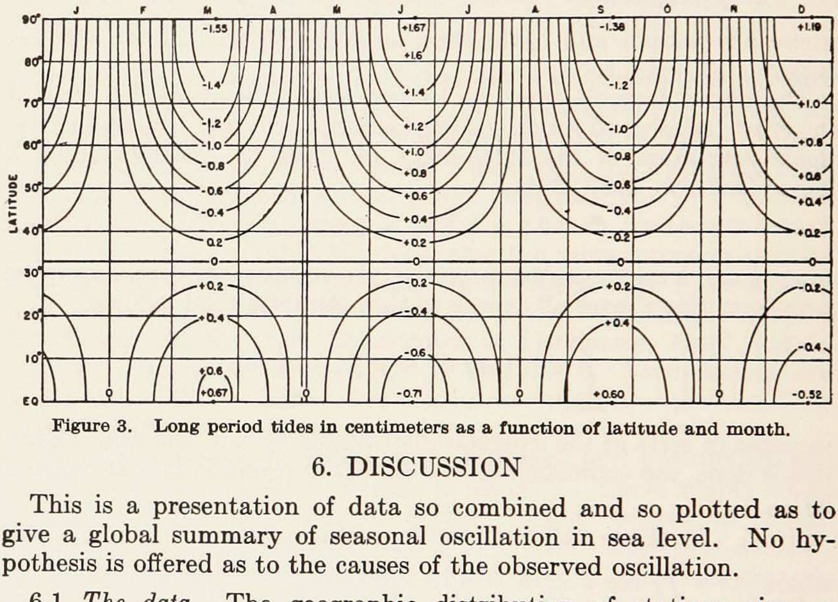

Figure 3. Long period tides in centimeters as a function of latitude and month.

6. DISCUSSION

This is a presentation of data so combined and so plotted as to give a global summary of seasonal oscillation in sea level. No hypothesis is offered as to the causes of the observed oscillation.

6.1 *The data.* The geographic distribution of stations gives a remarkably good picture of the geographic extent of western civilization, but it is hardly a desirable distribution from our point of view (see Chart 1). More than one third of the stations are around the shores of northern Europe and the British Isles. Some 72% of the tide gauge groups, 75% of the steric height summaries, 79% of the tide stations, and 92% of the tide station-years are from the northern hemisphere. Most of the sea level observations refer to shores of larger land masses. Sea level data in midocean are available for five island groups in the Atlantic and for ten islands in the Pacific. Vast areas of the North Atlantic and Pacific are without any midocean observations whatsoever, and one must beware lest the aversion of coral for cold water become the basis of a hypothesis for seasonal changes in sea level.

Comparison of the recorded and steric sea level observations is made difficult by the fact that these are for the most part neither synchronous nor adjacent. Moreover, different methods of averaging had to be used for these two kinds of observations; the steric departures show the result of smoothing whereas the recorded departures do not.

In this kind of study, questions concerning the reliability, even the reality, of the results are paramount. We have attempted to estimate the standard errors of the results obtained.

6.2 *Description of recorded sea levels.* The seasonal range varies from a few centimeters at several island stations in low latitude to 165 cm in the Bay of Bengal. Large seasonal changes are found in the monsoon regions of the western Pacific and Indian Ocean, in the Red Sea and the Persian Gulf, the west coast of Mexico and Central America, the North Atlantic north of 60°, the Gulf of Alaska, and the Sea of Japan. In general, amplitudes are smaller in the southern than in the northern hemisphere.

Fig. 4 is a synopsis of North Atlantic and North Pacific observations. Two zones of high annual activity correspond quite well to the subtropical and subpolar gyres of ocean circulation (Munk, 1950). In either zone the double-amplitude reaches close to a foot. In the subtropical zone, the high is in September, the low in March; in the subpolar zone the extremes occur three months later. There is an indication of an oscillation in the equatorial gyre which is roughly in phase with the subtropical gyre though only half as large.

Sea level in both hemispheres is generally low in their respective spring seasons and high in the fall. An exception occurs at the Great Australian Bight, where sea level is highest during the southern winter and lowest in summer. The boundary between the northern and southern types does not always follow the geographic equator; it lies north of it in the western Pacific and western Indian Ocean. The intrusion of the southern type into the Gulf of Siam is particularly striking (Chart 3).

In most regions the oscillation is annual in character. Pronounced semiannual oscillations in sea level occur off the west coast of India, in Indonesia, off the west coast of Africa, in the Labrador Current region of the western North Atlantic and the corresponding Oyashio region of the western North Pacific, and in the Gulf of Mexico and adjoining Gulf Stream stations (but not in the corresponding region of the Kuroshio!). A few curves on Chart 1 have even shorter period oscillations, but their reality is doubtful.

6.3 *Marginal seas.* In the Baltic (Chart 2), the Mediterranean, the North Sea, Hudson Bay, the Gulf of California, and the Sea of Japan, the annual variation in sea level corresponds closely to that

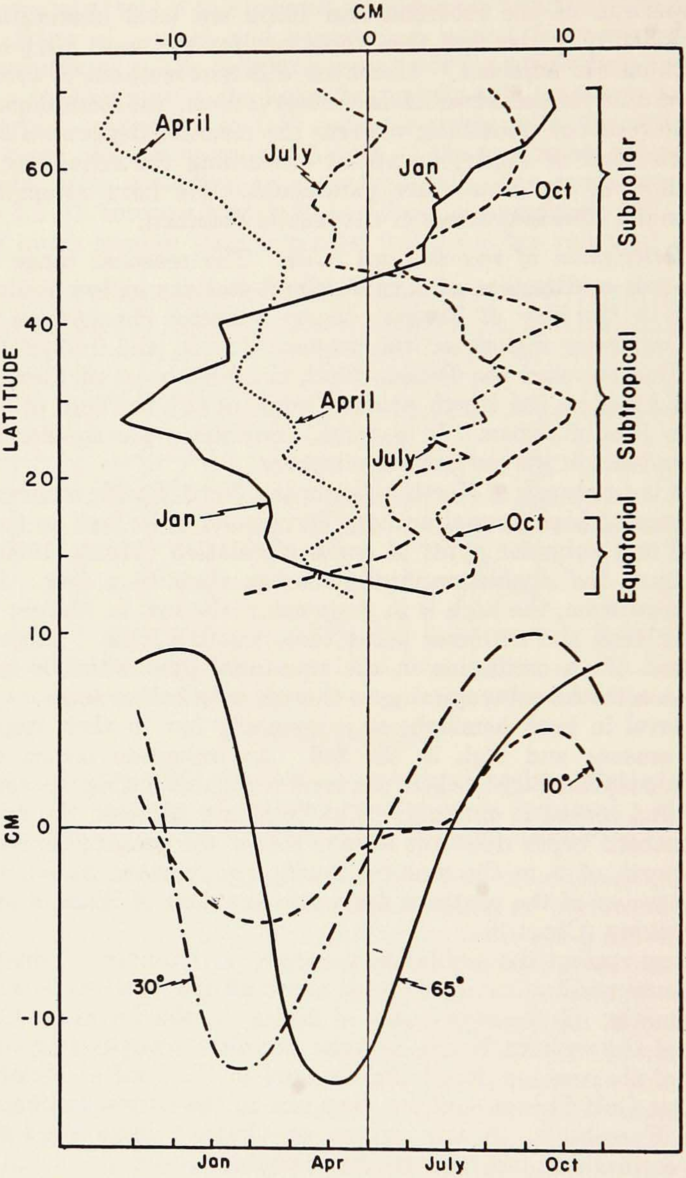

Figure 4. Upper. Recorded departures from mean sea level as a function of latitude for each of four months. Lower. Average recorded departures from mean sea level as a function of month. Each curve represents a ten-degree belt of latitude.

in the adjacent oceans at about the same latitude. Seasonal departures throughout these complex inland bodies of water are remarkably uniform. In the Red Sea the times of maximum and minimum sea level are similar to those in the western Indian Ocean, but the range is greater. The Persian Gulf is unlike any other region, and there are many complexities in the East Indies, corresponding to the complex topography and current systems of this region (see Chart 3). Striking double maxima in the Gulf of Mexico have already been referred to. Data for the Arctic Sea are completely inadequate.

6.4 *Description of steric sea levels.* The steric level is nearly equal to the algebraic sum of the thermal and haline departures. These two kinds of departures have quite different characteristics.

The average range of thermal departures is 11 cm. Maximum ranges of 25 cm are observed in the Sea of Japan and north of Bermuda. Small thermal departures are observed in some equatorial and most polar regions.

The haline departures do not tend to cluster around a mean value. Two-thirds of the z_S computations yield virtually negligible ranges—5 cm or less. The haline departures are consistently small around Bermuda and in the vast oceanic area east and southeast of Japan. Appreciable values of z_S occur: (a) at one location in the Bay of Bengal (a range of 41 cm); (b) at the five southern hemisphere localities that show deep thermal variations; and (c) along the continental slope off eastern Asia, from Formosa to Hokkaido.

On the whole, steric departures are in phase with recorded departures. In equatorial latitudes the steric departures are largely thermal and relatively small. The considerable irregularity from place to place prevents one from making any easy generalization, but recorded and steric departures may not be far out of line here.

In subtropical latitudes the steric departures are mostly thermal and quite large. On the average they agree well with the recorded departures.

In subpolar latitudes the thermal departures are small and the recorded departures large. Unfortunately the rôle of salinity remains in doubt. Where salinity observations are available, the water is shallow. Deep salinities are available for only the Oyashio (steric No. 58), which has abnormally small recorded departures. But there, at least, the haline departures are equivalent to the thermal departures, and together they lead to a fair agreement between steric and recorded departures. This suggests that in subpolar latitudes as well there may be agreement between recorded and steric departures. In order for this to be true there must be large and deep seasonal changes in salinity of the required amount, and as a consequence the haline departures must be large compared to the thermal departures. Observations will tell.

6.5 *Astronomic tides.* Comparison of Fig. 3 with Chart 1 shows that at all latitudes the long period astronomic tides are much smaller than the recorded departures in sea level.

6.6 *Atmospheric pressure effects.* In general, changes in atmospheric pressure exert an effect which is small compared with the observed departures in sea level. In most cases the effect of "correcting" for pressure is a small reduction in range; the average reduction for all stations is 1.6 cm. The groups where the pressure correction is most prominent are illustrated in Fig. 5. Column 1 contains all groups where the pressure correction *decreases* the range by more than 10 cm. All but one of these groups are in the seas surrounding Japan. Group 36 is off southern Greenland, near the center of the Icelandic low. Column 2 contains all cases where the range is *increased* appreciably. These groups are generally of southern hemisphere type, although a few are actually north of the equator. They occur off the southeast coasts of Africa, Australia, and New Zealand. The anomalous member of this set, No. 61, is located in the East China Sea. Column 3 illustrates stations where the phase is changed. Most of these have either rather small amplitudes or multiple maxima and minima, and the change of phase occurs when one of these extrema is accentuated by the correction. This class lacks geographical coherence.

6.7 *Isostasy.* In many regions the recorded departures nearly equal the steric departures plus the departures in atmospheric pressure. In such regions the total weight of water and air per unit area tends to remain nearly constant throughout the year, so that a pressure recorder at the sea bottom would show very small seasonal fluctuations. In analogy with geologic usage, this condition will be called *isostatic.* For oceanographic usage we suggest, as a strict definition, that conditions be called isostatic if the *hydrostatic* pressure due to atmosphere and ocean at a point on the deep sea floor does not change with time. Under such isostatic conditions the *measured* pressure at this point would remain nearly constant, varying only in response to accelerations in the fluid motion. Astronomic tides give rise to small departures from isostasy both because of changes in g and in water mass per unit area. In an isostatic region, surfaces of constant pressure coincide at depth with surfaces of constant gravitational potential.

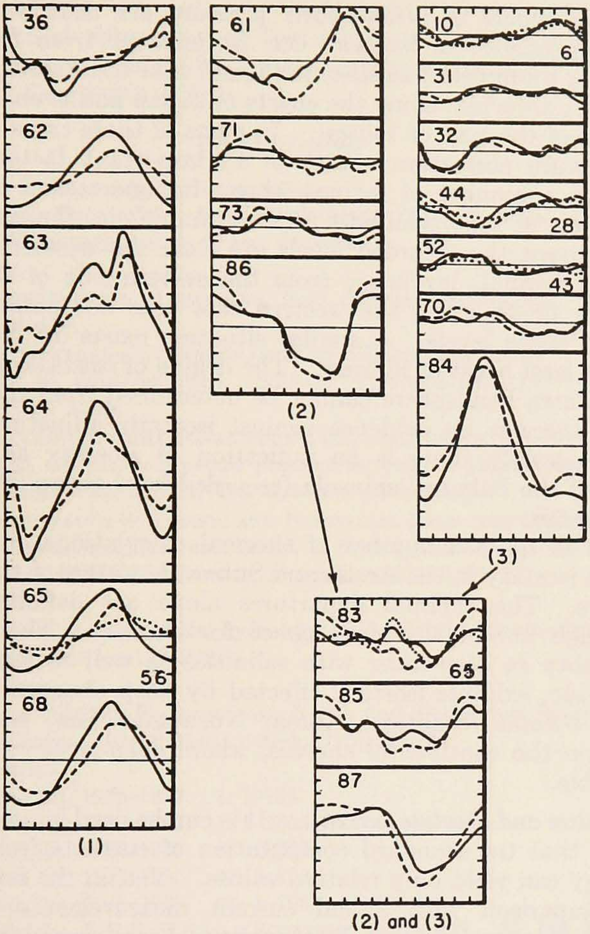

Figure 5. Groups for which the atmospheric pressure effect is most pronounced. Solid curves are recorded levels; dashed curves are the levels "corrected" for atmospheric pressure; dotted curves are steric levels. Column (1) includes all cases where the pressure correction decreases the range by more than 10 cm; column (2) where it increases the range by more than 5 cm; and column (3) where the time of maximum or minimum is changed by three months or more. Groups 83, 85 and 87 belong to both columns (2) and (3).

Nomitsu and Okamoto (1927) noted the close correspondence between recorded and steric levels off Japan, and LaFond (1939) demonstrated a similar correspondence off southern California, but the widespread occurrence of quasi-isostatic conditions emerges as a primary result of the present study.

Since the effects of atmospheric pressure are usually small, the latitude dependence of isostasy can be inferred from Section 6.4. Outstanding examples of isostasy are found near the Azores, Bermuda, Hawaii, off California, along the coasts of Japan and even in the high annual tide of the Bay of Bengal. In some of these cases the atmospheric pressure correction enters as an important factor (Fig. 5).

There are a number of regions where, for one reason or another, the situation is indeterminate. For example, in the area of the Florida Current the recorded levels are from the western side while the steric (thermal) levels are from the eastern side of the stream; the shallow depth along the western side does not permit the calculation of steric levels. A similar situation exists off Nova Scotia and off the west coast of Florida. The degree of isostatic adjustment in the southern hemisphere cannot be determined from the available data, but there is no evidence against isostatic adjustment at low latitudes; possibly there is an indication of isostasy as far south as 60° S, off the Palmer Peninsula (recorded level group 90 and steric level group 69).

In spite of quite a number of thermal calculations, little can be said about isostasy in the Arctic and Subarctic waters of the northern hemisphere. The thermal departures alone are definitely neither large enough nor of the right phase for isostasy. The only Subarctic locality *in deep water* with salinities as well as temperatures, off Hokkaido, exhibits isostasy effected by deep changes in salinity. Other cold-water localities (Korea, Norwegian Sea, Barents Sea, etc.) are on the continental shelves, where deep-level compensation is impossible.

6.8 *Relative and absolute currents.* It is emphasized in oceanographic textbooks that the standard computation of currents from dynamic topography can yield only relative values. Yet, in the few instances where comparison with actual current measurements have been made, the relative and absolute currents have agreed rather well. There is harmony between these findings and the widespread occurrence of isostatic conditions. For in isostatic regions, *seasonal changes* in absolute current can be determined from measurements of dynamic height. Our study can give no evidence concerning the mean conditions.

6.9 *The International Geophysical Year.* The principal shortcomings of the present data could be overcome by making synchronous and adjacent observations of recorded and steric levels, with emphasis on (1) island stations near deep water in the southern hemisphere, and (2) Subarctic waters, where recorded departures are large and thermal departures are not. A single year's observations should be sufficient to clarify many of the uncertainties that now remain. It is hoped that this might be accomplished during the forthcoming International Geophysical Year.

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As this paper went to press our attention was directed to a recent study by Eugénie Lisitzin, Les Variations Annuelles du Niveau des Océans, Bulletin d'Information, Comité Central d'Océanographie et d'Études des Côtes, No. 6, June 1955. Dr. Lisitzin studied the annual term on the basis of 140 selected stations distributed over all oceans. She has noted the phase reversal between northern and southern hemispheres as well as the three months phase lag in the subpolar regions relative to the subtropical regions. We pointed out this feature for the northern hemisphere only, but Dr. Lisitzin has found evidence for this in the southern hemisphere as well.

APPENDIX I

1. ATLANTIC (ARCTIC SECTOR): Barents Sea

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Liinahamari (Fi)	69°39N	31°22E	1931–39(1)	9	7.5	4.0	−7.4	−12.1	−13.0	−5.4	−4.5	−1.5	4.8	8.8	9.7	8.8
Vardö (No)	70°22N	31°06E	1880–85(3)	6	14.8	5.8	−6.4	−18.9	−15.7	−7.1	−1.2	1.2	0.3	3.0	11.9	11.7
Berlevåg (No)	70°51N	29°06E	1939–41(1), 1942–43(1)	5	5.9	7.3	−7.5	−5.5	−11.8	−6.1	−7.7	−3.5	3.2	5.0	7.7	13.2
				k = .22	9.1	5.5	−7.1	−12.2	−13.4	−6.1	−4.5	−1.3	3.1	6.1	9.8	10.9
				P_g	8.0	6.5	8.0	11.0	14.0	12.5	12.0	11.0	9.5	8.0	6.5	8.0
				c	−1.1	−2.6	−1.5	1.5	4.5	2.3	1.3	1.0	−0.6	−1.5	−2.8	−0.6
				±1.39	8.0	2.9	−8.6	−10.7	−8.9	−3.8	−3.2	−0.3	2.5	4.6	7.0	10.3

2. ATLANTIC: Norway, West

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Andenes (No)	69°19N	16°09E	1938–46(3)	9	6.4	5.2	−2.6	−6.9	−14.5	−8.4	−12.6	−3.0	1.9	9.6	11.0	13.7
Narvik (No)	68°26N	17°25E	1928–39(3)	12	8.7	−1.6	−6.0	−16.8	−14.1	−6.2	0.5	−2.6	1.2	10.9	14.9	11.6
Kabelvaag (No)	68°13N	14°30E	1880–85(3)	6	13.5	8.5	−7.3	−14.1	−6.0	−8.6	−4.2	−3.4	−3.8	2.0	9.3	14.5
Trondhjen (No)	63°26N	10°22E	1872–74(3), 1877–78 (2), 1880–81(2)	7	18.9	1.8	−10.1	−16.5	−7.7	−3.3	−5.9	−9.8	−3.9	9.0	15.8	11.3
Heimsjöen (No)	63°26N	9°07E	1935–41, 1943–46(1)	11	8.6	5.1	−8.0	−8.1	−15.1	−5.1	−6.1	−1.7	2.9	11.1	3.6	12.3
Kjöllesdal (No)	61°55N	5°38E	1935–41(2), 1943(1), 1945–46(1)	10	4.3	−0.5	−7.6	−9.2	−14.9	−4.8	−0.9	0.3	5.0	9.6	11.1	7.6
Bergen (No)	60°24N	5°18E	1883–89(2), 1928–40, 1944(1), 1946	22	8.4	−1.3	−7.1	−13.9	−13.8	−6.9	−0.7	1.8	2.5	11.0	11.6	8.8
Stavanger (No)	58°58N	5°44E	1881–85(5), 1928–39(1)	17	4.4	−4.2	−8.5	−9.3	−13.2	−2.6	0.1	3.3	2.1	9.8	15.3	2.6
				k = .10	8.7	0.9	−7.2	−11.8	−12.8	−5.6	−3.3	−1.3	1.4	9.6	11.8	9.7
				P_g	6.5	8.0	9.0	9.5	14.5	14.0	11.5	10.0	10.5	8.5	7.0	7.0
				c	−2.7	−1.2	−0.6	−0.1	4.9	3.7	0.7	−0.1	0.3	−1.1	−2.4	−1.7
				±1.13	6.0	−0.3	−7.8	−11.9	−7.9	−1.9	−2.6	−1.4	1.7	8.5	9.4	8.0

3. ATLANTIC: Skagerrak, Kattegat, and Eastern North Sea

Tregde (No)	58°00N	7°34E	1935–40, 1942–43(1), 1945–46	10	1.5	1.0	−8.5	−6.4	−8.5	−4.1	0.2	1.6	5.3	6.1	8.1	4.2
Nevlunghavn (No)	58°58N	9°53E	1935–41(2), 1943–46	11	−0.6	−1.3	−9.9	−8.9	−11.0	0.7	4.7	5.0	6.1	4.5	9.1	1.9
Oscarsborg (No)	59°41N	10°37E	1872–82(4)	11	−5.0	−13.0	−15.6	−15.2	−9.5	2.7	10.7	13.7	15.4	8.6	5.5	2.0
Oslo (No)	59°54N	10°45E	1885–90(1), 1928–46(1)	25	−0.1	−8.5	−11.3	−12.6	−11.9	0.8	8.3	9.0	7.7	10.0	6.9	1.2
Strömstad (Sw)	58°57N	11°11E	1900–23, 1925–40, 1946(1)	41	1.4	−4.3	−10.5	−10.6	−8.4	−0.2	4.9	7.5	4.5	4.0	6.7	4.7
Smögen (Sw)	58°22N	11°13E	1911–46	36	5.0	−2.8	−5.1	−6.4	−5.0	−2.1	1.1	2.6	2.1	3.6	2.9	3.9
Bäckevik (Sw)	58°22N	11°15E	1895–1928	34	1.8	−2.8	−9.5	−10.8	−8.0	−1.6	4.1	7.2	5.4	4.0	5.6	4.9
Göteborg (Sw)	57°43N	11°57E	1887–1900, 1902–46	59	0.6	−3.8	−9.3	−11.5	−9.4	−1.6	4.6	8.2	6.8	6.0	5.6	4.0
Varberg (Sw)	57°06N	12°13E	1887–1946	60	0.0	−4.3	−9.5	−10.4	−9.6	−1.6	4.7	8.2	7.1	6.7	5.1	3.6
Frederikshavn (De)	57°26N	10°34E	1893–1946(1)	54	1.7	−3.5	−9.6	−9.5	−10.4	−1.4	4.0	6.1	5.1	5.7	6.8	5.1
Hirtshals (De)	57°36N	9°57E	1892–1946(4)	55	1.2	−3.6	−10.7	−9.9	−11.0	−0.8	5.3	7.4	6.1	6.5	5.0	4.3
Esbjerg (De)	55°28N	8°27E	1889–1946(1)	58	5.2	−2.6	−10.7	−13.9	−16.1	−7.0	0.7	6.4	6.5	10.5	10.8	10.8
Bremerhaven (Ge)	53°34N	8°34E	1898–1943	46	−0.2	−4.5	−9.9	−6.5	−9.1	−0.2	4.4	6.7	5.1	5.1	5.1	3.4
				k = .05	1.2	−4.0	−9.8	−10.2	−9.9	−1.6	4.2	6.9	6.1	6.3	6.3	4.5
				P_g	13.0	13.0	12.5	12.0	14.0	14.0	13.5	13.5	15.0	13.0	13.0	13.0
				c	0.2	0.2	−0.7	−1.2	0.8	0.1	−0.9	−0.2	1.2	−0.2	0.0	0.7
				±.64	1.4	−3.8	−10.5	−11.4	−9.1	−1.5	3.3	6.7	7.3	6.1	6.3	5.2

4a. ATLANTIC: Sweden, East

Mem (Sw)	58°29N	16°25E	1887–1924	38	2.9	2.0	−4.7	−9.7	−9.7	−5.3	3.7	9.7	4.8	0.4	−1.1	6.4
Nedre Nyköping (Sw)	58°45N	17°01E	1909–20	12	6.8	−0.7	−9.4	−9.3	−9.6	−2.4	3.5	7.8	7.1	−0.4	−0.8	7.6
Landsort (Sw)	58°45N	17°52E	1887–1946	60	2.3	−0.3	−9.6	−12.0	−12.5	−3.6	5.5	9.2	7.2	4.6	2.0	6.6
N. Södertälje (Sw)	59°12N	17°38E	1869–1946	78	3.3	−1.2	−8.6	−12.3	−12.3	−2.7	5.7	8.8	7.0	4.3	2.5	5.6
Stockholm (Sw)	59°19N	18°05E	1889–1946	58	3.3	0.6	−8.9	−10.5	−12.2	−3.7	5.2	9.0	6.8	4.1	1.9	5.0
Grönskär (Sw)	59°17N	19°02E	1922–30	9	4.0	−9.1	−20.0	−17.8	−13.6	1.8	7.2	10.9	8.3	10.2	12.7	5.1
Björn (Sw)	60°38N	17°58E	1892–1946	55	4.4	0.3	−9.8	−11.5	−13.7	−5.1	4.2	8.3	7.2	4.6	3.5	7.1
Nedre Gävle (Sw)	60°41N	17°10E	1896–1946	51	5.7	−1.1	−9.3	−11.6	−12.3	−5.8	4.8	8.4	6.1	4.0	2.7	8.2
Draghällan (Sw)	62°20N	17°28E	1898–1946	49	6.3	0.4	−10.1	−12.1	−13.4	−5.6	4.2	8.0	9.7	3.3	3.0	6.4
Ratan (Sw)	64°00N	20°55E	1892–1946	55	6.9	1.8	−9.4	−12.0	−14.6	−6.2	2.2	6.4	6.8	4.3	5.4	8.0
				k = .05	4.4	−0.2	−9.4	−11.7	−12.5	−4.2	4.6	8.6	7.1	3.9	2.9	6.6
				P_g	14.0	13.5	13.0	12.5	14.0	14.0	12.5	12.5	15.5	14.0	14.0	13.5
				c	0.8	0.3	0.4	−1.1	0.4	−0.3	−2.3	−1.6	1.3	0.4	0.6	0.8
				±.57	5.2	0.1	−9.0	−12.8	−12.1	−4.5	2.3	7.0	8.4	4.3	3.5	7.4

4b. ATLANTIC: Gulf of Bothnia, North

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Furuögrund (Sw)	64°55N	21°14E	1916–46	31	8.8	−2.0	−12.3	−11.6	−10.5	−5.2	0.9	4.4	5.6	5.8	8.7	7.2
Kemi (Fi)	65°44N	24°33E	1920–44(3)	25	9.3	−3.0	−11.7	−16.6	−16.5	−5.4	2.7	6.4	6.0	7.6	11.7	9.8
Toppila (Fi)	65°02N	25°26E	1889–1944(6)	56	9.5	2.8	−8.4	−12.8	−14.9	−6.8	1.4	4.6	6.1	4.0	6.0	8.9
Hornankallio (Fi)	64°42N	24°30E	1922–44(1)	23	8.8	−1.9	−14.4	−15.5	−18.2	−4.9	2.9	5.8	6.5	9.4	11.3	9.9
				k = .09	9.1	−0.7	−11.4	−13.9	−14.8	−5.7	1.9	5.2	6.0	6.4	9.1	8.9
				P_g	8.0	9.5	11.0	11.0	14.0	12.5	11.0	11.0	11.0	11.0	9.5	11.0
				c	−2.4	−0.9	0.2	0.2	3.2	1.0	−1.0	−0.3	−0.4	0.2	−1.1	1.1
				±.86	6.7	−1.6	−11.2	−13.7	−11.6	−4.7	0.9	4.9	5.6	6.6	8.0	10.0

4c. ATLANTIC: Gulf of Bothnia, East

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Ykspihlaja (Fi)	63°50N	23°02E	1889–1924	36	6.4	3.2	−7.8	−14.0	−13.3	−5.8	3.1	7.4	8.4	2.2	2.7	7.5
Leppäluoto (Fi)	63°42N	22°42E	1914–44(2)	31	7.0	−1.9	−12.8	−13.8	−16.5	−3.5	2.9	5.9	7.4	7.9	6.8	10.2
Vaasa (Fi)	63°07N	21°36E	1883–1921(2)	39	6.7	3.9	−8.1	−14.5	−14.9	−7.8	2.0	6.6	7.4	3.6	3.3	11.4
Vaskiluoto (Fi)	63°06N	21°34E	1922–44	23	6.3	−3.8	−13.1	−14.2	−15.8	−2.8	4.6	7.3	6.8	8.9	8.7	7.1
Rönnskär (Fi)	63°04N	20°48E	1867–1910, 1920–36	61	7.8	1.1	−9.6	−16.2	−15.1	−6.1	3.3	7.1	6.1	6.8	6.5	7.8
Kaskinen (Fi)	62°23N	21°13E	1926–44(3)	19	3.9	0.1	−11.2	−10.7	−15.9	−4.7	4.7	6.5	4.9	8.8	7.9	6.1
Sälgrund (Fi)	62°20N	21°12E	1919–28(1)	10	12.3	−1.5	−12.1	−17.6	−13.0	−0.2	4.4	9.5	9.6	3.7	2.9	2.1
Reposaari (Fi)	61°37N	21°27E	1889–1926	38	7.1	3.0	−7.3	−12.9	−14.2	−6.4	2.1	7.7	7.9	2.0	2.7	7.9
Mäntyluoto (Fi)	61°36N	21°29E	1910–44(2)	35	4.7	−2.2	−10.0	−11.9	−14.3	−3.0	3.7	6.5	6.7	6.0	6.2	7.2
Säppi (Fi)	61°29N	21°20E	1919–36(2)	18	8.7	−4.6	−15.3	−15.9	−16.2	−2.8	5.3	10.4	6.5	10.7	8.4	4.9
Rauma (Fi)	61°08N	21°29E	1933–44	12	−0.3	0.5	−8.0	−8.3	−14.1	−4.9	5.1	7.2	5.7	6.8	4.8	5.5
				k = .06	6.5	0.1	−10.3	−13.8	−14.9	−4.8	3.5	7.3	7.0	5.9	5.5	7.5
				P_g	12.5	12.5	12.5	12.5	14.0	14.0	11.0	11.0	14.0	12.5	12.5	12.5
				c	0.4	0.4	0.0	0.0	1.5	0.8	−2.7	−2.0	0.9	0.0	0.2	0.9
				±.61	6.9	0.5	−10.3	−13.8	−13.4	−4.0	0.8	5.3	7.9	5.9	5.7	8.4

4d. ATLANTIC: Gulf of Bothnia, Southeast																
Lyökki (Fi)	60°51N	21°11E	1858–1936(1)	79	5.9	0.6	−11.5	−14.5	−13.8	−4.9	4.5	8.5	7.6	5.7	5.5	5.8
Lypyrtti (Fi)	60°36N	21°14E	1858–1936(1)	79	5.3	−2.2	−10.2	−14.4	−13.7	−3.4	4.6	8.5	7.2	5.4	5.7	7.0
Ruissalo (Fi)	60°25N	22°06E	1922–44(1)	23	7.4	−11.6	−23.4	−23.7	−24.4	−0.4	10.9	14.4	12.0	16.1	13.4	9.1
Heligman (Fi)	60°12N	19°18E	1920–36(1)	17	7.3	−3.8	−14.0	−14.8	−16.0	−2.9	5.2	9.6	6.0	10.3	9.0	4.2
Strömma (Fi)	60°11N	22°53E	1899–1936(1)	38	7.3	0.0	−11.4	−13.4	−14.1	−5.5	3.5	9.3	7.1	5.7	5.3	6.6
Lemström (Fi)	60°06N	20°01E	1889–1936	48	5.0	1.9	−9.8	−13.0	−14.5	−6.0	4.0	9.2	7.8	4.9	3.8	6.4
Lohm (Fi)	60°06N	21°40E	1920–27(1)	8	11.0	−6.7	−12.5	−14.2	−13.2	1.7	3.9	9.1	10.1	6.0	5.5	−1.2
Degerby (Fi)	60°02N	20°23E	1924–44	21	3.0	−2.4	−10.3	−18.7	−13.9	−2.5	6.9	8.3	7.6	9.8	6.9	4.9
Kobbaklintar (Fi)	60°02N	19°53E	1921–24, 1926–36	15	4.3	−6.2	−15.0	−15.0	−15.2	−2.6	7.2	10.6	5.2	11.7	10.3	4.8
Jungfrusund (Fi)	59°57N	22°22E	1858–1934	77	4.8	−0.3	−10.9	−13.9	−12.6	−3.8	5.5	8.9	7.7	4.5	5.0	5.2
Hanko (Fi)	59°49N	22°58E	1897–1903, 1921–39, 1942–44(1)	29	4.3	0.7	−10.5	−11.6	−13.7	−4.3	4.4	6.3	5.7	7.7	7.2	4.0
Utö (Fi)	59°47N	21°22E	1866–1936(2)	71	4.1	0.2	−10.5	−13.8	−13.9	−4.2	4.8	8.7	7.5	5.1	5.2	6.9
				k = .05	5.5	−1.7	−12.0	−14.8	−14.7	−3.7	5.3	9.1	7.6	7.1	6.4	5.7
				P_g	12.5	12.5	12.5	12.0	14.0	13.0	11.0	11.0	14.0	12.5	12.5	12.5
				c	0.5	0.5	0.1	−0.4	1.6	−0.1	−2.6	−1.9	1.0	0.1	0.3	1.0
				±.71	6.0	−1.2	−11.9	−15.2	−13.1	−3.8	2.7	7.2	8.6	7.2	6.7	6.7
4e. ATLANTIC: Gulf of Finland																
Russarö (Fi)	59°46N	22°57E	1866–1924, 1926–36(3)	70	4.4	−0.2	−9.6	−14.1	−12.7	−4.1	4.6	8.4	7.1	4.9	5.0	6.6
Tvärminne (Fi)	59°51N	23°15E	1921–36	16	5.0	−5.4	−14.2	−13.0	−15.8	−3.3	5.9	9.8	6.5	12.0	8.1	3.9
Skuru (Fi)	60°06N	23°33E	1900–36	37	3.4	−6.7	−11.0	−11.2	−11.2	−2.9	5.6	10.7	7.2	5.2	4.9	6.2
Helsinki (Fi)	60°09N	24°58E	1857–62(1), 1879–1944	72	4.1	−1.3	−10.1	−13.7	−13.1	−4.4	5.4	9.1	7.7	5.4	4.4	6.9
Söderskär (Fi)	60°07N	25°25E	1866–1936	71	3.5	−0.9	−11.4	−14.9	−13.0	−3.1	5.5	9.1	8.4	5.3	5.4	6.1
Kotka (Fi)	60°27N	26°57E	1908–12, 1914–27	19	7.3	−1.3	−16.1	−14.0	−12.0	−2.1	1.6	8.6	12.0	5.2	5.8	4.6
Hamina (Fi)	60°34N	27°11E	1928–44(1)	17	0.7	−4.7	−10.3	−11.0	−15.9	−2.4	6.7	8.1	6.7	9.3	6.6	5.8
Viipuri (Fi)	60°42N	28°44E	1889–1939(1), 1943–44(2)	53	3.3	−0.6	−13.3	−15.9	−15.9	−4.5	5.1	9.7	10.3	7.1	8.4	6.0
Koivisto (Fi)	60°21N	28°37E	1922–39(4)	18	3.5	−8.6	−16.5	−17.6	−15.0	−2.2	4.3	7.9	6.5	13.5	9.1	15.1
Suursaari (Fi)	60°05N	26°59E	1920–36(2)	17	3.4	−7.1	−13.4	−15.3	−13.6	1.7	9.1	11.5	8.2	10.6	4.8	0.5
Tallinn (Es)	59°27N	24°48E	1928–38	11	1.8	−1.6	−10.0	−11.9	−17.1	−4.2	8.1	8.8	5.1	12.0	8.7	0.2
				k = .05	3.7	−2.9	−12.0	−14.0	−13.8	−3.1	5.5	9.2	7.9	7.4	6.2	5.9
				P_g	13.5	13.0	13.0	12.5	15.0	12.5	10.5	11.0	13.5	13.5	13.0	13.0
				c	1.2	0.7	0.3	−0.2	2.3	−0.9	−3.4	−2.2	0.2	0.8	0.5	1.2
				±.62	4.9	−2.2	−11.7	−14.2	−11.5	−4.0	2.1	7.0	8.1	8.2	6.7	7.1

4f. ATLANTIC: Baltic Sea, Northeast

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Vilsandi (Es)	58°23N	21°49E	1928–38(1)	11	1.6	−3.9	−12.4	−11.1	−15.1	−2.6	1.0	10.0	6.0	14.0	11.1	1.6
Kolkasrags (La)	57°48N	22°38E	1884–93, 1901–13, 1925–36(1)	35	2.7	−1.2	−13.5	−15.1	−14.1	−3.2	6.1	11.2	7.7	7.4	4.7	7.1
Mērsrags (La)	57°20N	23°07E	1929–36	8	−2.0	−6.5	−13.7	−11.4	−14.0	−3.0	10.0	13.7	5.6	14.9	6.1	0.8
Daugavgrīva (La)	57°03N	24°02E	1872–1917, 1922–38(2)	63	−0.8	−3.3	−9.4	−8.2	−8.8	−0.9	7.4	10.5	8.1	2.8	1.3	1.7
Dzirnupe (La)	57°01N	24°07E	1931–36	6	−5.7	0.5	−12.6	−2.2	−9.4	−5.2	7.6	11.2	5.6	13.3	−2.6	−0.6
Andrejosta (La)	56°58N	24°06E	1930–36	7	−3.5	−3.7	−9.9	3.0	−5.6	−8.6	4.3	10.2	0.1	10.8	5.3	−2.4
Ainaži (La)	57°53N	24°20E	1930–36	7	2.8	−1.1	−14.4	−14.4	−17.3	−6.9	7.7	13.4	3.9	16.5	7.9	2.0
Salacgrīva (La)	57°45N	24°22E	1929–36	8	−3.9	−7.1	−4.2	−6.2	−16.2	−5.4	8.0	11.3	3.5	15.5	5.8	−0.8
				k = .09	−0.5	−3.2	−11.1	−9.1	−12.2	−3.8	6.6	11.3	5.8	10.0	4.6	1.9
				P_g	14.0	14.0	14.0	12.5	14.0	14.0	11.0	11.0	14.0	14.0	14.0	14.0
				c	1.1	1.1	0.7	−0.8	0.7	0.0	−3.5	−2.8	0.1	0.7	0.9	1.6
				±1.16	0.6	−2.1	−10.4	−9.9	−11.5	−3.8	3.1	8.5	5.9	10.7	5.5	3.5

4g. ATLANTIC: Baltic Sea, Southeast

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Ventspils (La)	57°24N	21°33E	1873–1913, 1920–36(3)	58	2.8	−2.3	−9.2	−13.1	−12.9	−3.8	5.5	10.4	7.5	5.4	5.1	4.8
Pāvilosta (La)	56°54N	21°11E	1930–36	7	1.8	1.9	−13.1	−11.9	−16.6	−8.4	6.0	11.7	3.2	14.7	8.8	1.7
Liepāja (La)	56°32N	20°59E	1865–93, 1896–1913, 1921–38	65	0.9	−3.4	−10.3	−13.4	−11.1	−2.8	6.4	8.7	8.6	5.6	5.5	5.0
Pape (La)	56°09N	21°02E	1930–36	7	1.2	1.8	−12.5	−12.3	−17.3	−9.3	6.1	12.0	3.2	16.3	9.0	1.7
Klaipeda (Li)	55°42N	21°08E	1937–38	2	−6.5	−4.5	6.5	13.0	−10.5	−2.5	9.5	−2.5	4.5	1.5	7.0	−15.5
Memel (Ge)	55°43N	21°07E	1898–1919	22	6.1	3.9	−19.0	−4.1	−12.0	−6.7	3.5	10.4	8.6	−1.0	1.3	9.5
Pillau (Ge)	54°38N	19°54E	1898–1943(1)	46	−0.5	−2.2	−10.1	−8.2	−10.8	−3.9	7.8	11.8	9.1	3.7	0.6	2.7
Hel (Po)	54°36N	18°48E	1931–38	8	−4.8	2.0	−6.9	−5.8	−11.0	−4.3	8.5	11.1	6.2	9.8	1.5	−6.5
Gdynia (Po)	54°32N	18°33E	1931–38	8	−3.2	2.5	−8.3	−17.5	−10.6	−3.6	8.4	10.2	7.7	11.0	3.8	−0.6
				k = .08	0.8	−0.5	−10.7	−10.2	−12.3	−4.7	6.4	10.2	7.3	6.5	4.1	2.9
				P_g	15.5	15.5	15.5	12.5	14.0	13.5	12.5	12.5	15.0	15.0	15.0	14.0
				c	1.8	1.8	1.4	−1.6	−0.1	−1.3	−2.8	−2.1	0.3	0.9	1.1	0.8
				±1.13	2.6	1.3	−9.3	−11.8	−12.4	−6.0	3.6	8.1	7.6	7.4	5.2	3.7

4h. ATLANTIC: Baltic Sea, Central

Limhamn (Sw)	55°35N	12°56E	1928-36(1)	9	−2.2	−3.4	−12.9	−10.8	−11.0	−3.3	7.8	10.1	6.6	13.0	5.2	1.4
Klagshamn (Sw)	55°31N	12°55E	1929-46(1)	18	−0.9	−3.4	−6.5	−3.7	−6.4	−1.9	6.4	8.2	5.1	5.6	0.9	−3.7
Ystad (Sw)	55°25N	13°49E	1887-1946	60	−0.7	−0.6	−7.0	−7.9	−8.2	−2.9	6.3	7.1	6.0	4.7	0.5	3.1
Kungsholms Fort (Sw)	56°06N	15°35E	1887-1946	60	4.4	−0.3	−8.7	−7.7	−10.7	−3.3	4.8	7.8	6.3	4.1	0.4	3.4
Ölands n. udde (Sw)	57°22N	17°06E	1923-46	24	0.2	−2.8	−11.4	−9.8	−11.8	−1.6	6.7	9.0	7.4	8.5	4.4	1.7
Stolpmünde (Ge)	54°35N	16°51E	1911-43	33	0.1	−3.4	−9.6	−8.1	−10.2	−0.7	6.9	9.9	9.0	6.3	−3.0	3.3
Swinemünde (Ge)	53°56N	14°17E	1811-1943(3)	133	−0.3	−2.8	−5.1	−5.7	−6.4	−0.6	7.1	7.9	5.6	0.3	−0.5	0.1
Arkona (Ge)	54°41N	13°26E	1882-1935(6)	54	−1.5	−0.6	−7.0	−8.3	−8.1	−2.3	4.6	7.7	6.5	4.5	1.2	3.4
				k = .05	0.1	−1.9	−7.8	−7.5	−8.7	−1.9	6.2	8.2	6.5	4.7	0.6	1.8
				P_g	15.5	14.5	13.5	12.5	14.0	14.0	13.0	13.0	15.5	14.0	14.0	13.5
				c	1.9	1.0	−0.4	−1.5	0.0	0.3	−2.2	−1.4	0.9	0.0	0.2	0.5
				±.65	2.0	−0.9	−8.2	−9.0	−8.7	−1.6	4.0	6.8	7.4	4.7	0.8	2.3

4i. ATLANTIC: Baltic Sea, West

Warnemünde (Ge)	54°11N	12°05E	1882-1943(3)	62	−3.3	−3.3	−5.3	−5.3	−4.5	1.2	6.3	8.6	6.3	3.0	−1.8	−1.9
Wismar (Ge)	53°54N	11°28E	1882-1943(4)	62	−4.7	−2.6	−6.8	−4.2	−3.1	2.0	6.9	7.9	6.4	2.2	−2.9	−1.3
Travemünde (Ge)	53°58N	10°53E	1855-1943(2)	89	−2.8	−2.0	−3.3	−2.6	−2.1	0.3	3.2	3.9	3.7	4.5	−1.8	−1.0
Marienleuchte (Ge)	54°30N	11°15E	1882-1943(4)	62	−3.3	−1.8	−5.5	−5.1	−4.4	0.3	5.3	7.0	5.7	3.3	−1.8	−0.1
Gedser (De)	54°34N	11°58E	1898-1946	49	−2.5	−2.6	−6.3	−5.2	−4.3	−0.8	5.7	7.9	6.4	3.7	−2.2	0.2
København (De)	55°41N	12°36E	1889-1946(1)	58	−0.8	−3.0	−8.4	−8.0	−8.2	−1.7	5.9	8.1	7.2	5.1	2.2	1.7
Hornbaek (De)	56°06N	12°28E	1898-1946(1)	49	−1.4	−4.9	−10.6	−9.4	−8.7	0.9	7.2	9.2	7.5	6.4	3.6	−0.2
Korsor (De)	55°20N	11°08E	1897-1946	50	−1.3	−2.7	−6.8	−6.3	−5.9	−1.6	4.3	6.3	5.7	4.8	1.7	1.9
Slipshavn (De)	55°17N	10°50E	1896-1946(1)	51	4.8	−2.7	−6.8	−6.6	−6.9	−4.4	3.7	5.5	5.1	4.5	2.8	1.1
Fredericia (De)	55°34N	9°46E	1889-1946(3)	58	−0.2	−2.3	−5.7	−5.8	−6.0	−2.4	2.2	4.1	4.6	5.5	3.8	2.6
Aarhus (De)	56°09N	10°13E	1888-1946(1)	59	5.2	−3.8	−7.0	−7.9	−8.4	−2.8	2.1	4.2	4.1	6.0	4.6	3.3
				k = .04	−0.9	−2.9	−6.5	−6.0	−5.6	−0.8	4.8	6.5	5.7	4.4	0.7	0.5
				P_g	15.5	14.0	12.5	12.5	14.0	14.0	14.0	13.5	15.5	14.0	13.5	13.5
				c	2.1	0.6	−1.3	−1.3	0.2	−0.5	−1.0	−0.8	1.1	0.2	−0.1	0.6
				±.57	1.2	−2.3	−7.8	−7.3	−5.4	−1.3	3.8	5.7	6.8	4.6	0.6	1.1

4. ATLANTIC: Baltic Sea Summary

k = .02	3.0	−1.7	−9.9	−11.1	−11.7	−3.3	5.0	8.3	6.8	5.9	4.0	4.4
c	0.8	0.6	0.2	−0.8	1.1	−0.1	−2.3	−1.7	0.6	0.4	0.2	0.9
±.24	3.8	−1.1	−9.7	−11.9	−10.6	−3.4	2.7	6.6	7.4	6.3	4.2	5.3

5. ATLANTIC: North Sea, West

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Aberdeen (Sc)	57°09N	2°05W	1862–1913	52	6.1	0.0	−6.1	−9.2	−9.2	−6.1	−3.1	0.0	0.0	6.1	9.2	12.2
Dundee (Sc)	56°27N	2°58W	1897–1912	16	6.7	1.1	−5.3	−8.8	−10.7	−8.3	−6.4	−0.7	−0.3	8.0	10.9	13.8
Dunbar (Sc)	56°00N	2°31W	1913–46(1)	34	3.1	−2.1	−5.5	−7.0	−7.9	−4.3	−0.9	1.2	2.4	6.4	7.6	6.1
Felixstowe (En)	51°56N	1°19E	1918–46(6)	29	−2.4	−4.6	−4.9	−3.4	−5.2	−1.8	0.6	2.7	4.3	6.4	5.2	2.4
				k = .09	3.5	−1.4	−5.5	−7.2	−8.2	−5.0	−2.3	0.8	1.6	6.7	8.2	8.6
				P_g	14.0	13.0	12.5	12.5	14.0	15.5	15.5	14.0	15.5	12.5	12.5	11.5
				c	0.9	−0.1	−1.0	−1.0	0.5	1.3	0.8	0.0	1.4	−1.0	−0.8	−0.9
				±1.15	4.4	−1.5	−6.5	−8.2	−7.7	−3.2	−1.5	0.8	3.0	5.7	7.4	7.7

6. ATLANTIC: Irish Sea

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Dublin (Ei)	53°21N	6°13W	1938–46	9	3.4	−5.5	−5.2	−5.2	−2.7	−3.1	0.0	−0.9	0.3	7.9	9.4	3.1
Douglas (En)	54°09N	4°28W	1938–46	9	3.7	−4.0	−6.1	−8.5	−6.4	−2.7	−1.2	−0.9	0.3	5.5	12.8	8.8
Liverpool (En)	53°25N	3°00W	1918, 1920, 1924, 1930, 1934–46	17	8.1	−4.7	−8.1	−7.9	−8.0	−3.9	−2.8	−0.6	4.9	8.3	7.8	6.6
Holyhead (En)	53°19N	4°37W	1838–39(2), 1846–47(2), 1938–46(2)	13	8.2	−1.6	−7.4	−8.6	−7.4	−4.3	−4.3	0.5	2.4	8.2	10.0	3.9
Milford Haven (En)	51°42N	4°57W	1886–92	7	−0.2	−11.1	−4.4	−5.9	−1.4	−3.2	0.8	4.4	−1.7	6.0	9.3	7.8
Avonmouth (En)	51°30N	2°43W	1925–46	22	5.4	0.5	−6.3	−6.6	−6.3	−4.5	−0.5	−1.7	3.7	6.8	8.7	1.0
Newlyn (En)	50°06N	5°33W	1916–46	31	1.8	−6.4	−1.1	−3.5	−2.6	−3.7	−2.8	−0.5	0.2	6.2	8.7	3.5
				k = .10	4.4	−4.4	−5.3	−6.4	−5.1	−3.7	−1.7	−0.1	1.6	7.0	9.3	4.5
				P_g	14.0	14.0	13.0	14.5	15.0	17.0	15.5	15.0	16.0	13.5	13.0	12.0
				c	0.1	0.1	−1.3	0.2	0.7	2.0	0.0	0.2	1.1	−0.8	−1.1	−1.4
				±.81	4.5	−4.3	−6.6	−6.2	−4.4	−1.7	−1.7	0.1	2.7	6.2	8.2	3.1

7. ATLANTIC: North Sea, South

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Delfzijl (Ne)	53°20N	6°56E	1865–1946	82	0.3	−3.7	−6.8	−8.0	−8.2	−1.8	2.1	4.5	4.6	6.3	6.6	4.7
Terschelling (Ne)	53°22N	5°13E	1921–46	26	1.2	−4.8	−9.6	−8.4	−9.2	−3.5	1.1	3.3	5.2	10.3	9.4	4.5
Harlingen (Ne)	53°10N	5°25E	1865–1946	82	0.9	−3.6	−7.6	−9.0	−9.9	−3.8	1.6	4.9	5.5	7.6	7.3	6.1
Den Helder (Ne)	52°58N	4°45E	1865–1946	82	1.7	−2.8	−7.1	−8.6	−9.0	−4.2	0.3	1.0	4.6	8.0	8.9	7.3
Ijmuiden (Ne)	52°28N	4°35E	1871–1946	76	0.4	−5.2	−7.3	−7.6	−7.8	−2.7	1.8	4.3	4.6	7.3	7.1	5.1

Hoek van Holland (Ne)	51°59N	4°07E	1864–1946	83	−1.3	−4.1	−5.7	−6.0	−6.4	−1.8	1.6	3.7	3.9	6.3	5.9	3.7
Maassluis (Ne)	51°55N	4°15E	1848–1936	89	0.4	−1.5	−3.7	−5.3	−6.5	−1.9	1.2	2.4	1.8	4.6	4.3	4.4
Hellevoetsluis (Ne)	51°49N	4°08E	1861–1946	86	−2.2	−4.5	−5.6	−5.6	−6.0	−1.7	1.8	3.4	3.1	4.8	5.1	7.2
Brouwershaven (Ne)	51°44N	3°54E	1872–1946	75	−2.1	−5.4	−6.0	−5.5	−5.2	−1.2	2.2	4.1	4.3	6.3	5.5	2.8
Zierikzee (Ne)	51°38N	3°55E	1872–1946	75	−2.7	−5.2	−5.7	−5.2	−4.8	−0.9	2.4	4.2	3.9	5.7	5.4	2.5
Vlissingen (Ne)	51°27N	3°36E	1862–1946	85	−2.4	−4.7	−5.3	−4.6	−4.5	−1.2	2.0	3.8	3.9	6.0	4.7	2.2
				k = .04	−0.6	−4.1	−6.3	−6.6	−7.0	−2.2	1.7	3.6	4.1	6.5	6.2	4.6
				P_g	14.0	14.0	13.0	13.0	14.0	15.0	15.0	14.5	17.0	14.0	14.0	14.0
				c	0.2	0.2	−1.2	−1.2	−0.2	0.1	−0.4	−0.2	2.2	−0.2	0.0	0.7
				±.40	−0.4	−3.8	−7.5	−7.8	−7.2	−2.1	1.3	3.4	6.3	6.3	6.2	5.3
				8.	ATLANTIC: English Channel											
Zeebrugge (Be)	51°21N	3°12E	Aug. 1942–July 1943(2)	1	1.6	3.2	−11.4	−3.0	−12.4	−6.6	0.8	−5.3	5.9	14.1	3.4	9.3
Antwerpen (Be)	51°14N	4°25E	1937–38, 1943–44(2)	4	8.2	7.5	−2.7	−1.4	−4.2	−7.4	−1.9	1.3	−0.6	2.3	6.3	−7.8
Ostende (Be)	51°14N	2°55E	1937–38, 1943–Jan. 1944(1)	3	6.4	−0.1	−4.6	−3.0	−5.8	−2.1	−1.0	0.8	−0.1	2.8	9.9	−0.5
Nieuport (Be)	51°09N	2°43E	1943	1	6.5	4.0	−5.2	1.4	−8.9	−8.9	−3.9	4.4	−0.8	2.7	13.5	−6.6
Dunkerque (Fr)	51°03N	2°22E	1942	1	−12.9	−14.8	−10.6	−8.3	0.9	−4.4	4.1	2.5	7.6	15.5	8.5	11.6
Calais (Fr)	50°58N	1°51E	June 1941–May 1942(2)	1	−10.2	−9.2	2.5	−23.8	−12.3	3.6	7.6	12.4	0.9	15.6	5.8	7.4
Boulogne (Fr)	50°44N	1°35E	1942	1	−12.5	−22.9	−8.9	−0.9	2.2	−5.2	41.0	15.1	−1.7	5.5	−13.2	1.2
Dieppe (Fr)	49°56N	0°21E	1942	1	−7.7	−18.0	−7.3	−7.8	0.2	−6.1	0.6	2.9	16.6	18.8	−0.4	8.6
Fecamp (Fr)	49°46N	0°21E	1942	1	−7.8	−15.9	−5.1	−6.5	2.1	−2.4	2.4	2.2	9.8	11.6	−1.2	10.9
Le Havre (Fr)	49°29N	0°06E	Dec. 1941–Nov. 1942(2)	1	−25.4	−4.4	15.9	2.7	0.6	5.5	10.1	−5.3	9.3	13.0	0.1	−22.3
Cherbourg (Fr)	49°39N	1°37W	1943	1	−31.9	−40.1	−21.8	−18.8	17.3	10.0	12.1	12.0	19.2	19.7	2.9	19.9
Guernsey (Fr)	49°27N	2°31W	1943	1	−11.7	−40.8	−35.8	−33.9	−8.6	10.7	15.9	21.3	22.0	31.6	21.8	8.0
Jersey (Fr)	49°14N	2°12W	Sept. 1943–Apr. 1944(2)	1	−7.1	−8.1		1.0					4.5	14.3	5.1	−9.6
St. Malo (Fr)	48°38N	2°02W	June 1942–May 1943(2)	1	14.7	−13.7	−9.9	−13.1	−9.8	13.9	3.2	0.4	1.5	5.2	−3.5	11.3
Lizardrieux (Fr)	48°47N	3°06W	1942	1	0.3	−10.1	−1.0	−6.8	−1.9	−7.9	−2.9	4.2	10.9	12.5	−3.5	6.6
Brest (Fr)	48°23N	4°29E	1807–35, 1846–56, 1861–1943	123	0.8	−2.0	−3.1	−3.1	−2.6	−3.7	−3.1	−1.7	0.6	6.4	6.8	4.5
				k = .14	−2.4	−7.1	−5.3	−5.7	−2.9	−2.1	1.9	1.9	4.0	9.3	5.2	3.2
				P_g	17.0	18.5	14.0	14.0	14.0	17.0	17.0	16.0	18.0	15.0	15.0	14.0
				c	1.7	3.2	−1.7	−1.7	−1.7	0.6	0.1	−0.2	1.7	−0.7	−0.5	−0.8
				±1.93	−0.7	−3.8	−7.0	−7.4	−4.6	−1.5	2.0	1.7	5.7	8.6	4.7	2.4

9. ATLANTIC: Bay of Biscay

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Lorient (Fr)	47°45N	3°21W	1942	1	−12.1	−8.5	2.3	3.0	3.4	−1.2	7.2	−3.2	−1.8	3.5	−2.7	9.9
St. Nazaire (Fr)	47°16N	2°12W	Apr. 1941–Mar. 1942(2)	1	−3.1	−8.8	6.9	2.2	−2.2	5.2	3.8	3.1	−8.1	−4.9	11.6	−5.9
La Pallice (Fr)	46°10N	1°13W	1942	1	−11.1	−15.3	−0.8	−1.5	4.8	1.4	−3.7	0.7	7.6	12.2	−0.2	6.1
Le Verdon (Fr)	45°33N	1°04W	1941–42(1)	2	−7.9	−11.9	4.5	5.5	2.9	1.0	−6.3	2.5	5.6	6.3	2.5	−4.3
St. Jean-de-Luz (Fr)	43°24N	1°41W	1942–44(3)	3	−5.6	−5.2	−4.2	−2.3	−5.4	15.9		−1.5	−0.2	9.7	−0.9	−0.2
				k = .36	−7.6	−9.2	0.8	0.8	−0.3	6.4	0.2	0.0	0.5	6.1	1.6	0.9
				P_g	18.5	18.5	15.5	15.5	15.5	18.5	17.5	17.0	18.0	15.5	15.5	17.0
				c	2.1	2.1	−1.3	−1.3	−1.3	1.0	−0.5	−0.3	0.6	−1.3	−1.1	1.1
				±2.11	−5.5	−7.1	−0.5	−0.5	−1.6	7.4	−0.3	−0.3	1.1	4.8	0.5	2.0

10. ATLANTIC: Iberian Peninsula

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Cascais (Po)[1]	38°41N	9°25W	1917–46(2)	30	−3.6	−5.2	−0.9	−0.5	−0.6	−1.9	−1.2	0.9	2.7	6.5	4.8	−0.5
Lagos (Po)[1]	37°06N	8°40W	1908–46(8)	39	−4.3	−5.3	−3.4	−3.3	−3.1	0.7	0.1	1.9	4.0	6.5	5.4	0.6
Cadiz (Sp)	36°30N	6°18W	1916–19(4)	4	0.7	0.5	−3.5	2.3	0.8	1.6	−2.5	−7.3	−2.9	−1.0	7.4	3.5
				k = .13	−3.3	−4.4	−2.5	−1.4	−1.5	−0.1	−0.8	0.1	2.4	5.7	5.5	0.7
				P_g	23.0	20.0	18.5	17.0	17.0	18.5	18.5	18.5	18.5	18.0	18.5	21.0
				c	4.6	1.6	−0.3	−1.8	−1.8	−1.0	−1.5	−0.8	−0.9	−0.8	−0.1	3.1
				±1.10	1.3	−2.8	−2.8	−3.2	−3.3	−1.1	−2.3	−0.7	1.5	4.9	5.4	3.8

11a. ATLANTIC: Mediterranean, North

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Alicante (Sp)	38°20N	0°29W	1916–20	5	−5.2	−6.0	−3.4	−3.2	−2.0	−4.9	1.6	3.4	3.2	6.4	8.4	1.5
Marseille (Fr)	43°18N	5°21E	1885–1946(1)	62	−1.4	−2.3	−2.5	−1.5	−1.4	−1.8	−2.6	−2.3	−1.1	4.8	7.8	3.9
Porto Maurizio (It)	43°52N	8°01E	1896–1922(4)	27	−3.0	−4.0	−2.9	−1.6	−1.9	−0.2	−0.3	0.3	0.6	4.3	6.1	2.8
Genova (It)	44°25N	8°55E	1883–1910, 1928–45(4)	46	−2.9	−2.0	−0.3	0.8	−3.2	−1.9	1.2	1.2	−2.3	3.4	4.1	2.3
Livorno (It)	43°32N	10°18E	1896–1911	16	−5.7	−4.1	−2.5	−0.9	−0.4	0.8	−1.4	−0.7	0.0	5.0	6.0	4.3
Civitavecchia (It)	42°03N	11°49E	1896–1922(6)	27	−1.3	−1.8	−1.9	−0.5	−2.1	−2.2	−2.6	−1.8	−0.7	3.9	6.5	4.5
Napoli (Arsenale) (It)	40°52N	14°16E	1899–1922(13)	24	−1.5	−1.2	−2.0	−1.2	−2.4	−1.0	−1.8	−0.6	−0.8	3.4	5.9	3.7
Napoli (Mandraccio) (It)	40°52N	14°16E	1896–1922(9)	27	−1.9	−3.1	−2.4	−0.6	−1.5	−1.1	−1.8	−0.5	−1.1	3.8	6.3	4.5
Messina (Si)	38°12N	15°34E	1897–1923(3)	27	−0.1	−0.7	−2.9	−1.4	−3.1	−2.4	−2.7	−0.8	−1.0	3.7	6.5	5.4
				k = .06	−2.2	−2.5	−2.2	−0.9	−2.0	−1.5	−1.3	−0.5	−0.7	4.1	6.3	3.7
				P_g	20.0	17.0	15.5	14.0	15.5	15.5	15.5	15.5	17.0	17.0	15.5	17.0
				c	4.2	1.2	−0.7	−2.2	−0.7	−1.4	−1.9	−1.2	0.2	0.8	−0.5	1.7
				±.39	2.0	−1.3	−2.9	−3.1	−2.7	−2.9	−3.2	−1.7	−0.5	4.9	5.8	5.4

11b. ATLANTIC: Mediterranean, Sardinia

La Maddalena (Sa)	41°14N	9°22E	1896–98, 1900–13(7)	17	−6.7	−7.3	−5.4	−3.3	−1.8	1.3	2.3	4.8	3.8	6.2	4.6	1.7
Cagliari (Sa)	39°12N	9°10E	1896–1934(12)	39	−6.8	−5.7	−5.6	−3.8	−2.6	−0.1	1.7	4.7	4.9	6.6	6.0	1.1
				k = .14	−6.8	−6.3	−5.5	−3.6	−2.3	−0.5	1.9	4.7	4.5	6.4	5.4	1.3
				P_g	18.5	15.5	14.0	13.0	14.0	14.0	15.0	14.0	15.5	15.5	15.5	17.0
				c	3.9	0.9	−1.0	−2.0	−1.0	−1.7	−1.2	−1.5	−0.1	0.5	0.7	2.9
				±.32	−2.9	−5.4	−6.5	−5.6	−3.3	−2.2	0.7	3.2	4.4	6.9	6.1	4.2

11c. ATLANTIC: Mediterranean, Sicily

Mazara del Vallo (Si)	37°40N	12°34E	1909–16(2)	8	2.0	−1.8	−1.2	−5.8	−4.8	−3.8	−4.9	−2.9	−0.7	4.6	11.6	7.5
Palermo (Si)	38°08N	13°20E	1896–1922(11)	27	−0.7	−1.6	−3.1	−1.6	−2.8	−1.9	−2.2	−0.7	0.8	5.2	6.3	2.9
Catania (Si)	37°30N	15°08E	1896–1920(9)	25	−1.5	−1.1	−3.0	−3.2	−4.1	−2.3	−0.7	1.6	1.1	3.6	5.7	4.5
				k = .13	−0.4	−1.4	−2.6	−3.2	−3.8	−2.5	−2.2	−0.3	0.6	4.4	7.3	4.6
				P_g	17.0	15.5	14.0	14.0	14.0	14.0	14.0	14.0	15.5	16.0	15.5	17.0
				c	2.4	0.9	−1.0	−1.0	−1.0	−1.7	−2.2	−1.5	−0.1	1.0	0.7	2.9
				±.77	2.0	−0.5	−3.6	−4.2	−4.8	−4.2	−4.4	−1.8	0.5	5.4	8.0	7.5

11d. ATLANTIC: Mediterranean, Adriatic

Taranto (It)	40°26N	17°16E	1906–11	6	−7.5	−0.5	−3.1	−1.9	1.9	0.9	−0.8	1.3	3.0	0.3	4.0	3.0
Ancona (It)	43°35N	13°29E	1896–1910(7)	15	−2.2	−0.4	−3.6	−1.6	−2.0	−1.5	−3.4	−3.3	−2.9	5.5	7.6	7.3
Porto Corsini (It)	44°30N	12°17E	1896–1922(3), 1937–42	33	−1.7	−2.1	−3.2	−0.1	−2.1	−1.0	−3.4	−3.2	−2.8	4.7	8.7	5.6
Venezia (Diga Sud di Lido) (It)	45°21N	12°23E	1917–34	18	−2.6	−6.1	−5.2	−0.4	−2.8	−0.3	−0.7	−1.1	−0.6	6.5	9.3	4.3
Venezia (Arsenale) (It)	45°24N	12°21E	1889–1913(7)	25	−4.1	−5.8	−2.7	−1.1	−0.4	0.0	−1.3	−1.3	−0.7	6.8	6.7	3.4
Venezia (S. Stefano) (It)	45°25N	12°20E	1896–1920(4)	25	−4.4	−5.3	−3.2	−0.1	−0.8	0.3	−1.3	−2.0	−1.4	5.5	7.1	5.4
Trieste (It)	45°39N	13°46E	1905–14, 1920–22, 1927–36(2)	23	−5.4	−8.0	−4.7	−0.3	−0.2	1.4	−0.4	−0.4	−0.2	5.7	9.5	3.8
Pola (It)	44°52N	13°51E	1897–1910, 1912–13	16	−5.4	−2.0	−3.7	−1.5	−1.3	0.6	−1.6	−1.7	−1.0	5.1	7.2	5.1
Bakar (Yu)	45°18N	14°32E	1930–38(2)	9	−10.1	−8.7	−9.7	−8.5	−9.0	−8.8	9.8	8.4	1.4	9.2	12.0	8.0
Split (Yu)	43°30N	16°27E	1930–38(2)	9	2.4	2.8	0.9	1.6	0.1	−1.7	−2.3	−3.2	−11.8	4.6	9.6	−3.2
				k = .08	−3.9	−3.9	−3.8	−1.1	−1.6	−0.8	−0.9	−1.1	−1.7	5.6	8.2	4.5
				P_g	17.0	15.5	15.5	13.5	14.0	14.0	14.0	14.0	15.5	17.0	17.0	17.0
				c	2.1	0.6	0.2	−1.8	−1.3	−2.0	−2.5	−1.8	−0.4	1.7	2.1	2.6
				±.82	−1.8	−3.3	−3.6	−2.9	−2.9	−2.8	−3.4	−2.9	−2.1	7.3	10.3	7.1

11e. ATLANTIC: Mediterranean, East

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Port Said (Su)	31°15N	32°18E	1923-46(1)	24	−2.1	−5.2	−9.4	−10.1	−7.8	−1.6	6.6	10.3	7.3	4.3	5.4	2.3
				k = .20												
				P_g	17.6	16.6	14.5	12.5	13.2	11.8	9.1	9.8	13.5	14.5	16.6	16.9
				c	4.2	3.2	0.7	−1.3	−0.6	−2.7	−5.9	−4.5	−0.9	0.7	3.0	4.0
					2.1	−2.0	−8.7	−11.4	−8.4	−4.3	0.7	5.8	6.4	5.0	8.4	6.3

11. ATLANTIC: Mediterranean Sea Summary

	J	F	M	A	M	J	J	A	S	O	N	D
k = .04	−3.0	−3.3	−3.4	−1.9	−2.4	−1.2	−0.6	−0.1	−0.1	4.9	7.0	3.8
c	3.4	1.4	−0.4	−1.7	−0.9	−1.9	−2.7	−2.1	−0.3	0.9	1.2	2.8
±.36	0.4	−1.9	−3.8	−3.6	−3.3	−3.1	−3.3	−2.2	−0.4	5.8	8.2	6.6

12. ATLANTIC: Azores

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Horta (Az)	38°32N	28°38W	1905–38(7), 1945	35	0.0	−1.9	−4.0	−3.6	−2.7	−0.5	1.1	2.7	3.2	3.0	1.6	0.7
Angra do Heroismo (Az)	38°38N	27°12W	1933–37(1)	5	−0.9	−2.9	−3.6	−6.1	−1.5	−2.8	−0.5	0.5	3.2	4.6	5.3	4.2
Ponta Delgada (Az)[2]	37°44N	25°40W	1924, 1930–51(4)	23	0.0	−2.9	−3.8	−3.6	−4.3	−1.6	0.5	2.5	4.1	4.1	2.7	2.4
				k = .07	−0.1	−2.4	−3.9	−4.0	−3.1	−1.3	0.6	2.3	3.5	3.7	2.6	1.9
				P_g	17.0	14.0	15.0	15.5	17.0	17.0	18.5	18.5	18.5	18.5	17.0	17.0
				c	0.5	−2.5	−1.9	−1.4	0.1	−0.6	0.4	1.1	1.0	1.6	0.3	1.0
				±.46	0.4	−4.9	−5.8	−5.4	−3.0	−1.9	1.0	3.4	4.5	5.3	2.9	2.9

13. ATLANTIC: Canary Islands

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Santa Cruz de Tenerife (CI) (a)[2,3]	28°29N	16°14W	1927–36(1), 1940–46(1)	17	−7.3	−6.2	−4.4	−1.9	−2.0	0.4	4.5	6.8	6.1	5.8	1.0	−2.9
Santa Cruz de Tenerife (CI) (b)[2,3]	28°29N	16°14W	1926–36(3), 1940–46(1)	18	−7.8	−6.7	−4.7	−1.8	−1.5	0.8	5.1	7.1	6.1	6.1	1.2	−3.8
				k = .17	−7.6	−6.4	−4.6	−1.8	−1.8	0.6	4.8	7.0	6.1	6.0	1.1	−3.4
				P_g	22.5	20.0	18.5	18.5	17.0	17.0	17.0	17.0	17.0	17.0	18.5	21.5
				c	4.4	2.0	0.1	0.1	−1.4	−2.1	−2.6	−1.9	−2.0	−1.4	0.3	4.0
				±.17	−3.1	−4.4	−4.5	−1.7	−3.2	−1.5	2.2	5.1	4.1	4.6	1.4	0.6

				14. ATLANTIC: Cape Verde Islands												
Porto Grande (CVI)[2] (St. Vincent)	16°53N	25°00W	1947–50	4	−3.3	−3.9	−2.1	−0.3	0.3	−0.1	0.2	1.4	1.7	2.0	2.6	1.2
				k = .50												
				P_g	17.0	17.0	16.5	16.0	16.0	16.5	16.5	15.0	15.5	15.5	15.5	16.0
				c	1.4	1.4	0.5	0.0	0.0	−0.2	−0.7	−1.5	−1.1	−0.5	−0.3	0.9
					−1.9	−2.5	−1.6	−0.3	0.3	−0.3	−0.5	−0.1	0.6	1.5	2.3	2.1
				15. ATLANTIC: Sierra Leone												
Freetown (SL)[4]	8°30N	13°14W	Feb. 1926–Jan. 1927(2)	1	−7.7	−3.0	−7.9	−5.3	−0.3	3.9	2.5	3.6	1.9	6.1	7.0	−0.7
				k = 1.00												
				P_g	14.0	11.0	11.0	11.0	11.0	12.5	13.0	12.5	12.5	12.5	11.0	11.0
				c	2.6	−0.4	−0.8	−0.8	−0.8	0.0	0.0	0.2	0.1	0.7	−0.6	0.1
					−5.1	−3.4	−8.7	−6.1	−1.1	3.9	2.5	3.8	2.0	6.8	6.4	−0.6
				16. ATLANTIC: Gulf of Guinea, Africa												
Takoradi (GC)	4°53N	1°45W	1929–46(1)	18	0.4	3.4	4.5	4.3	−0.4	−5.8	−9.8	−10.0	−4.8	5.5	9.8	2.6
Accra (GC)	5°32N	0°12W	Apr. 1922–Apr. 1923, 1938(2)	2	0.6	6.4	6.4	5.1	−1.6	−7.4	−14.7	−11.3	−0.4	6.7	10.3	0.0
Lagos (Ni)	6°24N	3°24E	Apr. 1940–Mar. 1941(2)	1	−0.1	−0.4	−1.6	−0.4	−0.4	−1.0	−8.9	−5.9	2.1	12.4	7.4	−3.4
Forcados (Ni)	5°22N	5°26E	Sept. 1934–Aug. 1935(2)	1	−7.8	1.0	2.3	5.3	−2.0	−2.9	−1.1	−2.0	1.7	5.0	5.6	−5.1
Port Harcourt (Ni)	4°46N	7°00E	Mar. 1935–Feb. 1936(2)	1	−3.8	−9.3	6.6	5.7	−2.6	−4.7	−4.1	−2.0	0.2	11.2	6.0	−3.2
Calabar (Ni)	4°58N	8°19E	1937	1	−5.1	−8.5	−1.4	−3.3	−13.6	−7.2	3.7	5.3	15.0	19.9	3.1	−7.8
				k = .25	−1.6	0.3	3.4	3.3	−2.4	−5.2	−7.1	−6.2	−0.1	8.6	8.0	−1.0
				P_g	12.4	12.4	10.7	12.4	10.4	10.4	14.0	12.4	12.4	10.7	12.4	12.4
				c	1.0	1.0	−1.1	0.6	−1.4	−2.1	1.0	0.1	0.0	−1.1	0.8	1.5
				±1.69	−0.6	1.3	2.3	3.9	−3.8	−7.3	−6.1	−6.1	−0.1	7.5	8.8	0.5
				17. ATLANTIC: Cape of Good Hope												
Capetown (SA)[5]	33°54S	18°25E	1888	1	−2.9	−2.0	3.2	1.3	−0.8	−2.0	−8.1	0.1	−1.4	5.6	6.2	0.4
				k = 1.00												
				P_g	13.9	14.9	15.9	17.6	17.6	19.3	20.0	20.0	18.3	17.6	17.6	15.2
				c	−2.9	−1.9	−1.3	0.4	0.4	1.4	1.6	2.3	0.5	0.4	0.6	−1.1
					−5.8	−3.9	1.9	1.7	−0.4	−0.6	−6.5	2.4	−0.9	6.0	6.8	−0.7

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
18. ATLANTIC: Magellan Strait																
Punta Arenas (Cb)[5]	53°09S	70°54W	1942–46(4)	5	−2.9	4.7	3.5	−1.5	6.6	0.7	−0.8	−8.1	−5.2	2.4	−1.1	1.6
				k = .45												
				P_g	99.9	99.0	99.0	1.7	2.0	1.4	1.0	0.7	3.0	99.0	98.3	98.0
				c	0.1	−0.8	−1.2	1.5	1.8	0.5	−0.4	0.0	2.2	−1.2	−1.7	−1.3
					−2.8	3.9	2.3	0.0	8.4	1.2	−1.2	−8.1	−3.0	1.2	−2.8	0.3
19. ATLANTIC: Argentina, South																
Deseado (Ar)[6]	47°45S	65°55W	1912–37(14)	26	6.2	1.6	−2.2	1.8	2.4	0.2	−0.9	−4.3	−4.8	−10.1	5.5	4.5
Comodoro Rivadavia	45°52S	67°29W	1911–19(3), 1926–41(6)	25	0.6	4.4	5.4	−0.3	−3.6	−1.5	0.1	−3.8	−4.6	−3.3	2.7	3.9
Puerto Madryn (Ar)	42°46S	65°02W	1944–46(1)	3	3.9	10.9	5.4	−4.1	1.9	7.4	−8.6	−5.9	−7.9	−2.3	−3.6	2.7
San Antonio (Ar)	40°48S	64°52W	1910–24(8)	15	7.4	5.7	2.5	−1.1	3.3	6.6	−4.4	−8.1	−7.0	−9.1	3.4	0.8
				k = .13	4.5	4.7	2.3	−0.3	0.7	2.2	−2.4	−5.3	−5.7	−6.8	3.0	3.2
				P_g	7.1	10.1	9.1	8.5	8.1	9.8	10.8	9.8	10.8	9.8	9.8	4.7
				c	−1.4	1.6	0.2	−0.4	−0.8	0.2	0.7	0.4	1.3	0.9	1.1	−3.3
				±1.34	3.1	6.3	2.5	−0.7	−0.1	2.4	−1.7	−4.9	−4.4	−5.9	4.1	−0.1
20. ATLANTIC: Argentina, Transition																
Belgrano (Ar)	38°53S	62°06W	1914–36(4), 1938	24	7.6	7.5	6.4	2.8	2.4	−1.3	−4.7	−7.7	−9.4	−5.9	−0.5	3.3
Quequén (Ar)	38°35S	58°42W	1910–46(7)	37	5.2	4.8	5.3	1.2	6.0	3.2	−2.1	−7.1	−10.5	−7.6	−1.0	2.1
Mar Del Plata (Ar)	38°03S	57°33W	1910–13(2), 1915–46(2)	36	4.3	4.9	4.5	5.3	4.9	−0.3	−2.8	−6.4	−9.4	−6.0	−0.1	1.5
				k = .10	5.6	5.6	5.3	3.1	4.6	0.6	−3.1	−7.0	−9.8	−6.5	−0.5	2.2
				P_g	9.8	12.8	13.2	14.2	12.8	15.2	15.9	15.9	16.6	13.9	12.8	9.5
				c	−3.3	−0.3	−0.3	0.7	−0.7	1.0	1.2	1.9	2.5	0.4	−0.5	−3.1
				±.66	2.3	5.3	5.0	2.4	3.9	1.6	−1.9	−5.1	−7.3	−5.1	−1.0	−0.9

				21. ATLANTIC: North Brazil Current											
La Plata (Ar)	34°55S	57°56W	1916–34	19	6.9	6.9	5.9	4.9	−0.1	−5.1	−7.1	−6.1	−5.1	−4.1	−0.1	2.9
Buenos Aires (Ar)	34°36S	58°22W	1905–43, 1945–46	41	7.5	7.2	7.3	4.8	−2.0	−7.6	−10.1	−4.9	−3.0	−1.9	−0.1	2.5
Puerto de Colonia (Ur)	34°29S	57°51W	1938–46	9	7.8	4.1	7.0	6.4	−1.6	−4.6	−9.2	−3.4	−6.2	0.2	−1.2	0.9
Montevideo (Ur)	34°53S	56°16W	1938–46	9	2.8	2.1	6.2	9.4	2.4	1.9	−6.2	−1.5	−8.0	−5.7	−2.6	−0.7
Puerto de Punta del Este (Ur)	34°58S	54°57W	1938–45	8	0.3	1.4	5.3	10.9	5.2	4.3	−6.0	−1.8	−11.7	−6.5	0.0	−1.6
				k = .11	5.5	4.9	6.5	6.8	0.3	−3.2	−8.1	−3.9	−6.1	−3.4	−0.7	1.2
				P_g	11.8	12.8	14.2	15.6	15.9	17.6	17.6	17.6	16.6	14.9	13.2	11.5
				c	−2.6	−1.6	−0.6	0.8	1.1	2.1	1.6	2.3	1.0	0.1	−1.4	−2.5
				±1.09	2.9	3.3	5.9	7.6	1.4	−1.1	−6.5	−1.6	−5.1	−3.3	−2.1	−1.3
				22. ATLANTIC: British Guiana											
Georgetown (Gu)	6°48N	58°10W	May 1927–Apr. 1928(2)	1	4.0	3.4	−2.4	−1.2	−4.3	−3.4	−4.0	−0.3	0.9	0.3	2.1	4.9
				k = 1.00												
				P_g	10.7	12.4	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	8.9	10.7
				c	0.5	2.2	0.1	0.1	0.1	−0.6	−1.1	−0.4	0.0	0.1	−1.5	1.0
					4.5	5.6	−2.3	−1.1	−4.2	−4.0	−5.1	−0.7	0.9	0.4	0.6	5.9
				23. ATLANTIC: Venezuela											
Port of Spain (Tr)	10°39N	61°31W	Nov. 1937–Oct. 1938(2)	1	−12.8	−16.3	−9.6	−7.6	−1.7	3.0	5.1	9.0	8.4	11.3	11.1	0.1
Zaparita (Ve)	11°01N	71°39W	1939–46(3)	8	−4.5	−4.1	−5.2	−3.4	−0.4	0.6	0.4	0.3	1.0	5.6	7.7	1.9
Tablazo (Ve)	10°53N	71°37W	1944–46	3	−10.5	−13.5	−13.8	−5.3	4.8	8.1	5.1	1.4	1.4	5.7	11.5	5.4
Zapara Island (Ve)	10°58N	71°34W	1929–36(4), 1938–39, 1941	11	−6.4	−9.3	−9.0	−5.4	0.2	2.1	−0.1	2.1	4.5	7.5	11.1	2.3
				k = .22	−7.4	−9.3	−8.9	−5.0	0.8	3.0	1.8	2.1	3.1	6.9	10.1	2.6
				P_g	13.5	14.0	13.5	13.0	13.0	13.0	13.5	13.0	12.0	11.5	12.5	13.0
				c	1.0	1.5	0.6	0.1	0.1	−0.6	−0.6	−0.4	−1.5	−1.4	−0.2	1.0
				±1.27	−6.4	−7.8	−8.3	−4.9	0.9	2.4	1.2	1.7	1.6	5.5	9.9	3.6
				24. ATLANTIC: Panama Canal Zone											
Cristobal (CZ)	9°21N	79°55W	1909–46	38	−0.4	−2.2	−2.7	−2.6	−1.9	−1.7	−0.4	0.5	1.6	3.4	5.1	1.5
				k = .16												
				P_g	11.0	14.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
				c	0.2	3.2	−0.2	−0.2	−0.2	−0.9	−1.4	−0.7	−0.8	−0.2	0.0	0.7
					−0.2	1.0	−2.9	−2.8	−2.1	−2.6	−1.8	−0.2	0.8	3.2	5.1	2.2

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
25. ATLANTIC: Gulf of Mexico, West																
Galveston (US)	29°19N	94°47W	1908–46(1)	39	−11.2	−9.3	−5.7	1.1	5.9	4.1	−4.5	−1.7	13.2	12.9	1.8	−6.1
				k = .16												
				P_g	21.0	18.5	17.0	15.5	15.5	15.5	17.0	15.5	15.5	17.0	20.0	20.0
				c	4.1	1.6	−0.3	−1.8	−1.8	−2.5	−1.5	−2.3	−2.4	−0.3	2.9	3.6
					−7.1	−7.7	−6.0	−0.7	4.1	1.6	−6.0	−4.0	10.8	12.6	4.7	−2.5
26. ATLANTIC: Gulf of Mexico, East																
Pensacola (US)	30°24N	87°13W	1923–46(1)	24	−10.5	−10.1	−6.7	−2.0	1.2	3.0	2.5	7.0	12.3	9.6	0.6	−6.7
Cedar Keys (US)	29°08N	83°02W	1914–25(1)	12	−9.8	−10.0	−6.6	−3.2	1.8	5.1	8.6	8.5	8.9	4.1	−0.2	−7.1
Key West, C. Wharf (US)	24°34N	81°48W	1913–25	13	−7.0	−6.7	−6.3	−4.5	−1.2	−0.6	−0.9	2.8	9.8	10.7	6.5	−2.1
Key West, Naval Base	24°33N	81°48W	1926–46(2)	21	−6.2	−8.2	−8.0	−4.2	−2.5	−1.8	−1.5	3.6	8.9	13.0	7.6	−0.3
				k = .12	−8.3	−8.7	−7.0	−3.4	−0.3	1.1	1.6	5.3	10.1	9.9	3.9	−3.8
				P_g	21.0	18.5	17.0	15.5	15.5	15.5	17.0	15.5	15.5	17.0	20.0	20.0
				c	4.2	1.7	−0.2	−1.7	−1.7	−2.4	−1.4	−2.2	−2.3	−0.2	3.0	3.7
				±1.18	−4.1	−7.0	−7.2	−5.1	−2.0	−1.3	0.2	3.1	7.8	9.7	6.9	−0.1
27. ATLANTIC: Cuba and Cat Cay																
Havana (Cu)[2]	23°09N	82°20W	1947–51(1)	5	−8.1	−8.6	−3.8	−2.9	−1.4	1.3	0.5	6.3	9.8	6.9	0.5	−3.2
Pinar del Rio (Cu)[2,7]			1949–51(3)	3	−4.8	−12.2	−8.1	1.3	5.6	3.1	6.2		5.2	1.5	−2.6	0.4
Casilda (Cu)[2]	21°45N	79°59W	1949–51	3	−7.1	−8.5	−6.4	−2.8	2.2	2.4	0.9	5.8	10.5	7.1	−0.3	−3.9
Guantanamo Bay (Cu)[2]	19°54N	75°09W	1937–51(4)	14	−4.8	−5.6	−4.4	−3.5	−0.6	−0.7	0.4	2.9	6.8	7.3	4.0	−1.8
Baracoa (Cu)[2]	20°21N	74°30W	1949–51(3)	3	−11.9	−8.9	−5.4	0.1	9.6	6.3	−5.1	5.7	4.3	6.0	5.7	−6.4
Gibara (Cu)[2]	21°07N	76°08W	1949–51	3	−8.0	−9.0	−5.5	−2.0	3.0	0.8	0.4	6.0	7.3	7.0	2.7	−2.7
Cat Cay (Ba)[5]	24°19N	75°26W	1938–41(3), 1950–51(2)	5	−6.2	−6.5	−5.2	−2.7	−1.6	−0.2	2.7	7.5	10.0	6.6	−1.7	−2.6
				k = .17	−7.0	−8.1	−5.4	−2.0	2.0	1.5	0.8	5.3	7.6	6.2	1.5	−2.8
				P_g	18.5	18.0	17.3	16.5	15.5	15.5	16.7	16.0	14.5	13.7	15.5	18.0
				c	2.7	2.2	1.1	0.3	−0.7	−1.4	−0.7	−0.7	−2.3	−2.5	−0.5	2.7
				±.87	−4.3	−5.9	−4.3	−1.7	1.3	0.1	0.1	4.6	5.3	3.7	1.0	0.1

				28. ATLANTIC: Florida Current												
Miami Beach (US)	25°46N	80°08W	1931–46(1)	16	−5.4	−6.3	−8.5	−4.1	−1.3	−3.4	−5.4	−0.9	8.6	16.5	10.5	−0.3
Mayport (US)	30°24N	81°26W	1928–46(1)	19	−6.5	−7.5	−9.6	−5.7	−3.2	−3.4	−7.4	−1.1	13.6	21.3	10.6	−0.9
Fernandina (US)	30°41N	81°28W	1897–1924(2)	28	−9.9	−8.7	−8.4	−3.8	0.5	0.8	−6.8	−4.1	14.5	21.2	8.7	−4.4
Charleston (US)	32°47N	79°55W	1921–46(1)	26	−8.7	−8.1	−8.6	−3.3	−1.7	−1.7	−4.7	0.7	13.2	17.3	7.8	−2.5
				k = .11	−7.8	−7.7	−8.7	−4.2	−1.3	−1.8	−6.0	−1.4	12.6	19.1	9.3	−2.2
				P_g	20.0	20.0	17.0	17.0	17.0	15.0	17.0	17.0	17.0	17.0	20.0	20.0
				c	2.6	2.6	0.2	−0.8	−0.8	−3.5	−2.0	−1.3	−1.4	−0.8	2.4	3.1
				±.76	−5.2	−5.1	−8.5	−5.0	−2.1	−5.3	−8.0	−2.7	11.2	18.3	11.7	0.9
				29. ATLANTIC: Bermuda												
Ireland Island (Be)	32°19N	64°50W	1833–43(1)	11	1.0	1.0	−3.8	−5.7	−4.7	−3.8	−4.7	−1.1	2.3	10.5	5.6	3.5
St. Georges (Be)	32°22N	63°42W	1932–37(4)	6	0.7	−2.0	−4.1	−5.7	−2.3	−1.6	1.3	4.0	0.7	5.2	3.4	0.3
				k = .24	0.9	−0.2	−3.9	−5.7	−3.7	−2.9	−2.3	0.9	1.7	8.4	4.7	2.2
				P_g	20.0	20.0	20.0	18.5	19.0	20.0	21.5	20.0	18.0	18.0	18.0	18.5
				c	1.2	1.2	0.8	−0.7	−0.2	0.1	1.1	0.3	−1.8	−1.2	−1.0	0.2
				±1.13	2.1	1.0	−3.1	−6.4	−3.9	−2.8	−1.2	1.2	−0.1	7.2	3.7	2.4
				30. ATLANTIC: Gulf Stream												
Hampton Roads (US)	36°57N	76°20W	1927–46(3)	20	−7.0	−6.8	−5.2	−0.6	−0.5	2.0	0.2	4.1	10.9	8.4	1.0	−6.4
Baltimore (US)	39°16N	76°35W	1902–46(1)	45	−12.8	−13.2	−8.2	−0.9	4.5	8.6	8.5	10.1	10.6	6.1	−3.2	−10.4
Atlantic City (US)	39°21N	74°25W	1911–20(1), 1922–46	35	−8.5	−7.2	−5.6	−1.4	0.2	3.6	2.9	6.5	8.0	6.6	0.1	−5.7
Fort Hamilton (US)	40°37N	74°02W	1893–1920	28	−9.0	−12.4	−8.1	0.7	3.2	5.9	4.4	7.4	6.8	6.5	−0.5	−5.4
New York, W. St. (US)	40°42N	74°01W	1928–46	19	−9.2	−9.5	−4.9	0.2	1.4	5.5	5.4	6.7	8.1	5.1	−0.5	−7.8
New York, Pier (US)	40°42N	74°01W	1920–27	8	−11.2	−4.2	−5.4	−1.2	4.3	4.0	3.1	5.8	6.2	3.4	0.4	−5.4
Newport (US)	41°30N	71°20W	1930–46(2)	17	−5.5	−6.1	−4.6	−2.5	−0.9	4.0	4.3	4.7	5.4	4.6	0.9	−4.4
				k = .08	−9.3	−9.1	−6.3	−0.8	1.9	5.1	4.5	6.9	8.3	6.0	−0.5	−6.8
				P_g	20.0	18.0	18.0	18.0	18.0	17.0	18.0	17.0	17.0	20.0	20.0	20.0
				c	2.1	0.1	−0.3	−0.3	−0.3	−2.0	−1.5	−1.8	−1.9	1.7	1.9	2.6
				±.77	−7.2	−9.0	−6.6	−1.1	1.6	3.1	3.0	5.1	6.4	7.7	1.4	−4.2

31. ATLANTIC: Gulf of Maine

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Boston (US)	42°21N	71°03W	1921–46(1)	26	−4.6	−3.5	−2.5	−0.3	0.7	3.4	1.8	1.8	2.0	2.6	1.3	−2.2
Portland (US)	43°40N	70°15W	1912–46(1)	35	−4.6	−3.8	−3.9	−0.4	1.5	3.7	2.8	1.8	1.4	2.0	0.8	−2.3
Eastport (US)	44°54N	66°59W	1929–46(1)	18	−1.6	−0.8	−1.1	0.1	0.1	1.6	1.6	−1.2	−0.7	0.9	0.9	−0.4
St. John (Ca)	45°15N	66°04W	1930–34, 1938, 1942, 1946	8	−1.5	−3.5	−1.8	3.5	6.4	3.6	0.9	−1.2	−2.5	0.1	−1.4	−2.7
				k = .11	−3.4	−3.0	−2.5	0.4	1.8	3.1	1.9	0.6	0.5	1.6	0.6	−1.9
				P_g	18.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	17.0	17.0	17.0	17.0
				c	2.7	0.7	−0.7	−0.7	−0.7	−1.4	−1.9	−1.2	0.2	0.8	1.0	1.7
				±.64	−0.7	−2.3	−3.2	−0.3	1.1	1.7	0.0	−0.6	0.7	2.4	1.6	−0.2

32. ATLANTIC: Gulf of St. Lawrence

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Father Point (Ca)	48°31N	68°28W	1938–39, 1942(1), 1945–46	5	−2.7	−4.5	−3.0	1.9	4.3	5.0	1.6	−1.1	−3.9	0.7	−1.4	3.1
Portage Island (Ca)	47°08N	65°03W	1917–19(3) (July–Oct. only)	3							3.6	2.1	−1.2	0.3		
Point Peter (Ca)	48°38N	64°10W	1924–25(1)	2	−5.4	−12.1	−16.1	−5.1	1.0	5.0	4.4	5.9	3.2	6.5	5.3	7.4
				k = .32	−3.6	−7.0	−7.4	−0.4	3.2	5.0	3.0	1.6	−1.4	1.7	0.8	4.5
				P_g	14.0	12.5	12.0	14.0	13.5	12.5	12.0	13.5	15.5	15.0	14.0	14.0
				c	1.0	−0.5	−1.4	0.6	0.1	−1.6	−2.6	−0.4	1.5	1.6	0.8	1.5
				±1.61	−2.6	−7.5	−8.8	0.2	3.3	3.4	0.4	1.2	0.1	3.3	1.6	6.0

33. ATLANTIC: Nova Scotia and Prince Edward Island

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Halifax (NS)	44°40N	63°34W	1922–25(1), 1927–28 (2), 1933, 1935–38, 1941–46	16	2.9	1.7	−0.3	−1.7	−3.5	−1.7	−4.7	−2.9	−2.2	3.0	4.5	5.4
Charlottetown (PEI)	46°13N	63°08W	1934, 1940, 1942, 1946	4	2.3	4.9	−2.9	−2.3	−4.3	−0.6	−1.8	−3.2	−3.7	2.1	3.2	6.3
St. Paul Island	47°12N	60°09W	1921–26(2)	6	0.0	−0.3	0.1	−2.4	−3.6	−1.4	−3.3	−1.4	−1.4	5.6	3.4	4.7
				k = .20	2.0	2.0	−0.8	−2.0	−3.7	−1.4	−3.6	−2.6	−2.4	3.4	3.9	5.4
				P_g	14.5	12.5	12.5	13.5	14.0	14.0	14.0	15.0	17.0	16.0	14.5	12.5
				c	0.8	−1.2	−1.6	−0.6	−0.1	−0.8	−1.3	0.4	2.3	1.9	0.6	−0.7
				±.57	2.8	0.8	−2.4	−2.6	−3.8	−2.2	−4.9	−2.2	−0.1	5.3	4.5	4.7

34. ATLANTIC: Newfoundland

Harrington (Ca)	50°31N	59°27W	1940–42, 1945–46	5	2.4	2.1	−4.6	−6.5	−3.4	0.2	−3.1	−1.9	−1.3	5.1	5.1	6.0
Port Aux Basques (Ne)	47°34N	59°07W	1935–37(2)	3	0.0	5.8	−2.8	−1.6	−3.4	−0.3	3.3	−2.5	−0.3	−2.5	1.5	2.7
St. John's (Ne)	47°34N	52°42W	1935–37(2)	3	12.4	10.2	1.7	−4.4	−8.1	−11.7	−6.2	−5.6	0.8	1.1	1.4	8.4
				k = .30	4.9	6.0	−1.9	−4.1	−5.0	−3.9	−2.0	−3.3	−0.3	1.2	2.7	5.7
				P_g	10.5	9.5	10.0	12.5	13.0	13.5	13.5	14.0	15.5	14.5	12.5	9.5
				c	−1.4	−2.4	−2.3	0.2	0.7	0.5	0.0	1.2	2.6	2.2	0.4	−1.9
				±1.85	3.5	3.6	−4.2	−3.9	−4.3	−3.4	−2.0	−2.1	2.3	3.4	3.1	3.8

35. ATLANTIC: Hudson Bay

Churchill (Ca)	58°47N	94°12W	1940–43	4	0.6	−8.3	−9.8	−11.3	−1.6	0.0	3.9	0.9	5.8	8.5	8.5	2.7
				k = .50												
				P_g	17.5	18.5	18.5	18.5	17.5	13.5	10.5	11.0	12.5	13.0	14.0	15.5
				c	2.9	3.9	3.5	3.5	2.5	−2.2	−5.7	−4.5	−3.1	−2.0	−0.8	1.4
					3.5	−4.4	−6.3	−7.8	0.9	−2.2	−1.8	−3.6	2.7	6.5	7.7	4.1

36. ATLANTIC: Greenland, South

Ivigtut (Gr)[5]	61°12N	48°11W	1944–49(2)	6	6.6	−1.2	−0.6	−11.6	−12.8	−4.7	−2.2	−2.1	0.1	6.3	7.1	15.1
				k = .41												
				P_g	97.0	2.0	5.0	9.8	11.4	11.0	9.3	9.5	8.0	5.0	3.0	99.0
				c	−8.3	−3.3	−0.7	4.1	5.7	4.6	2.4	3.3	1.7	−0.7	−2.5	−5.8
					−1.7	−4.5	−1.3	−7.5	−7.1	−0.1	0.2	1.2	1.8	5.6	4.6	9.3

37. ATLANTIC: Iceland

Reykjavik (Ic)[3]	64°09N	21°56W	1951	1	12.6	−1.0	−16.5	−15.8	−14.0	−8.5	−4.0	0.5	0.6	10.8	12.4	22.6
				k = 1.00												
				P_g	97.5	2.0	6.0	9.5	14.0	12.5	10.5	9.5	8.0	5.0	4.0	99.0
				c	−8.5	−4.0	−0.4	3.1	7.6	5.4	2.9	2.6	1.0	−1.4	−2.2	−6.5
					4.1	−5.0	−16.9	−12.7	−6.4	−3.1	−1.1	3.1	1.6	9.4	10.2	16.1

38. ARCTIC OCEAN: Greenland, North

Cape Sheridan	82°27N	61°21W	Dec. 1908–June 1909(2)	1	1.0	5.2	−14.0	−3.9	−6.7	10.4						8.0
				P_g	15.0	17.0	21.0	23.5	22.5	18.5						15.5
				c	−3.7	−1.7	1.9	4.4	3.4	−1.3						−2.7
					−2.7	3.5	−12.1	0.5	−3.3	9.1						5.3

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
39. ARCTIC OCEAN: Point Barrow																
Uglaamie (Al)[8]	71°15N	156°37W	Mar.–June, 1883				9.1	−3.0	−2.4	−3.6						
				P_g			22.0	19.0	17.5	16.0						
				c			3.6	0.6	−0.9	−3.1						
							12.7	−2.6	−3.3	−6.7						
40. PACIFIC: Aleutian Islands																
Massacre Bay (Al)[5]	52°50N	186°48W	1943–52(6)	10	6.5	1.1	−2.4	−8.7	−4.3	−3.8	−0.6	0.1	−1.2	1.7	5.1	6.6
Constantine Harbor (Al)[5]	51°25N	180°43W	1944–47(4)	4	−2.9					−4.7	−2.1	0.3	−2.0	3.3	6.2	9.1
Sweeper Cove (Al)[5]	51°51N	176°39W	1943–52(1)	10	5.4	5.8	−0.5	−6.4	−2.8	−3.4	−5.3	−3.3	−2.1	1.2	5.0	6.4
Dutch Harbor (Al)[5]	53°54N	166°32W	1934–39 ,1946–52(1)	13	1.9	4.4	−2.6	−5.4	0.1	−3.3	−5.8	−7.3	−1.0	5.1	5.2	8.7
				k = .17	3.1	3.8	−1.9	−6.7	−2.1	−3.8	−3.9	−3.2	−1.5	3.0	5.3	7.7
				P_g	2.7	2.0	8.0	9.5	9.5	11.2	13.7	12.5	9.5	7.0	3.8	2.0
				c	−4.4	−5.1	0.5	2.0	2.0	3.0	5.0	4.5	1.4	−0.5	−3.5	−4.6
				±.93	−1.3	−1.3	−1.4	−4.7	−0.1	−0.8	1.1	1.3	−0.1	2.5	1.8	3.1
41. PACIFIC: Alaska																
Seward (Al)	60°06N	149°27W	1925–38(2), 1944–46(2)	17	4.5	5.2	−1.6	−8.7	−9.7	−10.5	−7.5	−5.8	−1.9	11.2	12.6	11.9
Yakutat (Al)[5]	59°33N	139°44W	1940–52	13	10.4	2.5	−0.9	−6.6	−12.1	−11.4	−9.2	−7.5	−1.3	11.2	11.7	13.1
				k = .18	7.4	3.8	−1.2	−7.6	−10.9	−11.0	−8.4	−6.6	−1.6	11.2	12.2	12.5
				P_g	9.5	10.0	11.0	10.0	11.3	13.5	15.0	13.0	10.0	5.0	5.0	6.5
				c	0.0	0.5	1.1	0.1	1.4	2.9	3.9	2.6	−0.5	−4.9	−4.7	−2.5
				±.81	7.4	4.3	−0.1	−7.5	−9.5	−8.1	−4.5	−4.0	−2.1	6.3	7.5	10.0
42. PACIFIC: Alaska and British Columbia																
Sitka (Al)[5]	57°03N	135°20W	1938–52	15	9.5	4.0	0.1	−4.5	−9.7	−10.7	−9.5	−9.6	−3.2	8.2	11.2	14.5
Ketchikan (Al)	55°20N	131°38W	1919–46	28	9.6	4.7	−1.2	−5.4	−7.3	−6.6	−7.6	−9.2	−5.5	4.7	10.5	13.5
Prince Rupert (BC)	54°19N	130°20W	1933, 1939, 1945–46	4	11.5	0.8	2.0	−9.3	−5.0	−5.3	−5.3	−12.0	−2.2	−0.1	8.1	16.7
				k = .16	9.9	3.7	0.2	−5.8	−7.8	−7.9	−7.9	−9.9	−4.1	5.1	10.3	14.4
				P_g	10.0	12.0	12.0	12.5	14.0	15.3	17.0	16.5	14.0	10.5	9.0	9.0
				c	−2.2	−0.2	−0.6	−0.1	1.4	2.0	3.2	3.4	0.8	−2.1	−3.4	−2.7
				±.92	7.7	3.5	−0.4	−5.9	−6.4	−5.9	−4.7	−6.5	−3.3	3.0	6.9	11.7

				43. PACIFIC: British Columbia and Washington												
Canoe Pass (BC)	50°15N	125°25W	June 1945–May 1946(2)	1	5.7	11.8	3.8	−2.3	−5.3	−17.2	−2.3	−5.0	−5.9	−4.7	5.1	16.3
Pt. Atkinson (BC)	49°19N	123°15W	1927–33, 1939, 1946	9	6.1	−1.6	−1.8	−9.2	−1.6	0.0	−0.9	−0.6	2.7	−4.3	−1.2	12.5
Vancouver (BC)	49°18N	123°07W	1920–23(2), 1931, 1935, 1941, 1945–46	9	8.3	3.6	0.1	−8.9	−6.4	−2.0	−2.3	−3.2	−2.1	−0.7	1.7	12.0
Victoria (BC)	48°26N	123°23W	Apr. 1923–Mar. 1924 (2), 1932, 1936, Apr. 1940–Mar. 1941(2), 1945–46	6	8.0	8.4	0.1	−6.0	−3.6	−5.3	−3.8	−5.0	−3.0	−2.6	0.8	11.7
Clayoquot (BC)	49°09N	125°55W	1935, 1941, 1946	3	18.6	15.6	7.4	−3.9	−9.1	−10.0	−10.3	−11.8	−5.8	−5.4	0.4	14.4
Neah Bay (US)[5]	48°22N	124°37W	1934–52(2)	19	11.8	11.2	4.1	−3.9	−8.5	−9.7	−10.6	−10.3	−7.4	0.3	8.3	14.6
Seattle (US)	47°36N	122°20W	1899–1946	48	9.3	7.0	1.5	−3.5	−4.5	−4.5	−4.8	−4.9	−4.8	−3.1	3.9	8.6
Crescent City (US)[5]	41°45N	124°12W	1933–47, 1950–52(1)	18	5.6	7.6	−0.4	−7.9	−7.0	−6.9	−3.7	−2.2	0.9	0.0	3.9	10.1
				k = .11	9.1	7.3	1.5	−5.7	−5.7	−5.8	−5.0	−5.2	−3.1	−2.2	3.3	11.6
				P_g	17.0	17.0	16.5	17.0	17.0	16.5	17.5	17.0	16.3	17.5	17.0	17.0
				c	0.6	0.6	−0.3	0.2	0.2	−1.0	−0.5	−0.3	−1.1	0.7	0.4	1.1
				±1.09	9.7	7.9	1.2	−5.5	−5.5	−6.8	−5.5	−5.5	−4.2	−1.5	3.7	12.7
				44. PACIFIC: California Current												
San Francisco (US)	37°48N	122°28W	1897–1946(1)	50	1.8	1.4	−1.4	−5.4	−5.0	−2.3	1.5	2.4	4.1	2.1	−0.1	1.2
Los Angeles (US)	33°43N	118°16W	1923–46(1)	24	−1.7	−3.0	−6.1	−7.4	−5.4	−1.8	3.6	5.7	7.3	4.9	2.1	1.6
La Jolla (US)	32°52N	117°15W	1924–46(1)	23	−1.8	−3.2	−6.1	−7.3	−5.8	−1.9	3.2	5.9	7.7	4.8	2.4	1.8
San Diego (US)	32°42N	117°14W	1916–25	10	−0.8	−4.2	−5.7	−7.2	−5.7	−1.1	4.0	5.0	6.5	5.9	2.2	1.5
				k = .10	−0.4	−1.7	−4.4	−6.6	−5.4	−1.9	2.8	4.5	6.2	4.0	1.4	1.5
				P_g	19.5	18.5	17.5	15.5	14.5	12.5	12.5	13.3	12.8	15.5	18.0	19.5
				c	4.2	3.2	1.8	−0.2	−1.2	−3.9	−4.4	−2.9	−3.5	−0.2	2.5	4.7
				±.69	3.8	1.5	−2.6	−6.8	−6.6	−5.8	−1.6	1.6	2.7	3.8	3.9	6.2
				45. PACIFIC: Mexico												
Guaymas (Me)[5]	27°51N	110°54W	1942–44(2)	3	−17.1	−15.6	−13.1	−9.5	−0.9	13.2	18.7	17.8	20.2	8.8	−9.6	−12.8
La Paz (Me)[5]	24°10N	110°19W	1950(1)	1								5.9	11.1	7.1	1.0	−4.7
Acapulco (Me)[5]	16°51N	99°55W	1949–50(2)	2	−1.8	−10.4	−13.7	−10.2	1.2	11.4	12.2	7.9	6.4	0.0	0.1	−3.1
Salina Cruz (Me)[5]	16°10N	95°12W	1941–44(2)	4	−20.1	−20.4	−9.1	−1.2	6.5	12.9	10.4	16.2	15.0	1.9	−6.1	−5.7
				k = .33	−15.2	−16.5	−11.6	−6.3	2.5	12.7	14.1	13.6	14.8	4.8	−5.0	−7.5
				P_g	15.2	15.9	14.2	13.5	12.8	11.8	11.8	10.8	12.2	13.5	15.2	17.6
				c	2.0	2.7	0.6	−0.1	−0.8	−2.5	−3.0	−3.3	−2.0	−0.1	1.8	4.9
				±2.06	−13.2	−13.8	−11.0	−6.4	1.7	10.2	11.1	10.3	12.8	4.7	−3.2	−2.6

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
				46. PACIFIC: Central America												
San Jose (Gu)[5]	13°55N	90°50W	1949–50(1)	2	3.9	−3.2	−16.0	−9.2	−4.1	5.4	4.2	10.3	−1.6	3.2	3.4	3.7
La Union (ES)[5]	13°20N	87°49W	1948–50(1)	3	0.7	−4.5	−5.1	−6.8	0.8	3.4	4.7	2.7	2.8	3.1	−0.7	−1.0
San Juan del Sur (Ni)[5]	11°15N	85°53W	1949–50(2)	2	−8.8	−14.2	−8.1	−7.5	5.3	9.2	7.1	7.7	5.7	4.4	0.7	−1.4
Puntarenas (CR)[5]	9°58N	84°50W	1941–50(1)	10	1.4	−4.9	−7.5	−6.2	−0.1	2.0	4.0	4.5	1.8	0.9	0.4	3.7
Balboa (CZ)	8°58N	79°34W	1909–46	38	−8.1	−17.7	−17.5	−11.3	2.5	7.0	6.4	5.1	8.0	10.9	9.2	6.1
Naos Island (CZ)[5]	8°55N	79°32W	1949–50(1)	2	−9.9	−19.7	−17.5	−15.1	3.2	9.3	7.0	7.3	9.9	12.7	11.3	1.4
Buenaventura (Co)[5]	3°54N	77°6W	1941–46, 1948–50(1)	9	−1.8	−12.7	−13.4	−6.4	3.6	6.0	4.0	2.9	3.8	5.0	5.7	4.2
				k = .14	−3.7	−12.0	−12.9	−8.9	1.8	5.7	5.3	4.9	5.0	6.4	5.1	3.6
				P_g	13.9	13.2	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.8	13.9
				c	1.6	0.9	−0.2	−0.2	−0.2	−0.9	−1.4	−0.7	−0.8	−0.2	0.3	2.1
				±1.35	−2.1	−11.1	−13.1	−9.1	1.6	4.8	3.9	4.2	4.2	6.2	5.4	5.7
				47. PACIFIC: Central South America												
La Libertad (Ec)[5]	2°12S	80°55W	1948–50(3)	3	−1.9	−0.6	0.9	−2.8	2.4	5.3	2.1	−3.4	−3.7	−1.7	0.8	2.6
Talara (Pe)[5]	4°35S	81°17W	1942–50	9	3.8	6.2	4.2	2.7	2.3	2.5	−0.2	−3.4	−4.9	−4.9	−4.6	−3.7
Callao (Pe)[5]	12°03S	77°09W	1942–50	9	2.2	5.1	4.7	3.2	3.4	2.0	−0.6	−3.6	−5.1	−5.5	−3.2	−2.5
Matarani (Pe)[5]	17°00S	72°07W	1941–50(2)	10	3.6	3.2	3.9	2.4	3.6	0.1	−2.1	−4.1	−4.9	−4.0	−1.9	0.2
Valparaiso (Ch)[5]	33°01S	71°38W	1941–47(2)	7	3.4	2.5	3.0	2.4	−0.4	2.5	−1.0	−1.0	−4.5	−5.0	−3.1	1.2
				k = .17	2.5	3.6	3.5	1.9	2.2	2.3	−0.5	−3.1	−4.7	−4.4	−2.6	−0.6
				P_g	12.5	13.2	13.9	14.5	15.9	16.2	16.2	16.9	16.6	16.6	15.2	13.9
				c	−2.1	−1.4	−1.1	−0.5	0.9	0.5	0.0	1.4	1.0	1.6	0.4	−0.2
				±.71	0.4	2.2	2.4	1.4	3.1	2.8	−0.5	−1.7	−3.7	−2.8	−2.2	−0.8
				48. PACIFIC: Gulf de Ancud												
Puerto Montt (Ch)[5]	41°29S	72°58W	1942–46(4)	5	−1.2	−4.4	−1.8	−1.5	2.0	2.2	2.3	2.0	2.4	−4.2	0.6	1.5
				k = .45												
				P_g	12.2	12.8	12.5	13.9	11.5	13.9	14.9	13.5	14.5	15.2	14.2	11.5
				c	−0.7	−0.1	−0.8	0.6	−1.8	−0.1	0.4	−0.3	0.6	1.9	1.1	−0.9
					−1.9	−4.5	−2.6	−0.9	0.2	2.1	2.7	1.7	3.0	−2.3	1.7	0.6

				49. PACIFIC: Hawaii												
Honolulu (TH)	21°18N	157°52W	1905–46	42	−1.3	−1.9	−2.1	−3.2	−2.9	−2.2	−0.1	2.4	4.7	4.1	2.0	0.6
				k = .15												
				P_s	17.0	17.2	17.6	18.5	18.5	18.1	17.5	16.5	16.5	16.5	16.6	17.0
				c	0.2	0.4	0.4	1.3	1.3	0.2	−0.9	−1.2	−1.3	−0.7	−0.4	0.7
					−1.1	−1.5	−1.7	−1.9	−1.6	−2.0	−1.0	1.2	3.4	3.4	1.6	1.3
				50. PACIFIC: Johnston Island												
Johnston Island[5,9]	16°45N	169°31W	1947–51(3)	5	−4.6	−4.1	−7.1	1.0	−4.3	−5.0	−2.4	5.6	11.0	4.8	0.5	4.6
				k = .58												
				P_s	14.5	14.5	15.5	15.5	15.0	15.0	14.5	13.5	13.5	13.5	14.2	14.0
				c	0.6	0.6	1.2	1.2	0.7	0.0	−1.0	−1.3	−1.4	−0.8	0.1	0.6
					−4.0	−3.5	−5.9	2.2	−3.6	−5.0	−3.4	4.3	9.6	4.0	0.6	5.2
				51. PACIFIC: Palmyra Island												
Palmyra Island[5,10]	5°53N	162°05W	1947–49(3)	3												
				k = .58	−2.1	−2.1	−7.1	−9.4	−8.5	−11.8	−8.1	8.6	8.3	12.4	12.4	7.7
				P_s	11.8	10.8	11.8	14.2	14.2	13.2	13.5	13.5	13.5	12.5	12.2	11.8
				c	−0.5	−1.5	−0.9	1.5	1.5	−0.2	−0.4	0.3	0.2	−0.2	−0.3	0.0
					−2.6	−3.6	−8.0	−7.9	−7.0	−12.0	−8.5	8.9	8.5	12.2	12.1	7.7
				52. PACIFIC: Samoa												
Pago Pago (Sa)[5]	14°17S	170°41W	1949–51	3	−2.2	2.3	4.0	3.4	3.4	−1.6	−2.8	−3.5	−2.0	−0.9	−0.9	0.7
				k = .58												
				P_s	11.8	9.8	11.8	13.5	13.5	14.2	14.5	14.9	13.5	12.2	12.2	11.8
				c	−0.5	−2.5	−0.9	0.8	0.8	0.8	0.6	1.7	0.2	−0.5	−0.3	0.0
					−2.7	−0.2	3.1	4.2	4.2	−0.8	−2.2	−1.8	−1.8	−1.4	−1.2	0.7
				53. PACIFIC: Guam												
Apra Harbor (Gu)[5]	13°26N	144°39E	1949–51	3	−6.5	−4.4	0.1	2.9	4.6	5.7	5.9	4.3	2.8	−2.2	−7.3	−5.9
				k = .58												
				P_s	12.2	11.5	12.5	11.8	11.8	11.2	10.8	8.8	9.1	9.1	11.5	12.2
				c	1.6	0.9	1.5	0.8	0.8	−0.5	−1.4	−2.7	−2.5	−1.9	0.7	2.1
					−4.9	−3.5	1.6	3.7	5.4	5.2	4.5	1.6	0.3	−4.1	−6.6	−3.8

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
				54. PACIFIC: Marshall Islands												
Kwajalein (MI)[5]	8°44N	167°44E	1946–51(3)	6	−6.0	−1.0	1.5	2.7	1.4	−0.4	0.2	0.8	2.4	1.3	−0.9	−2.1
				k = .41												
				P_g	11.8	9.8	11.8	12.5	12.5	12.5	12.5	12.5	12.5	9.1	11.8	11.2
				c	0.6	−1.4	0.2	0.9	0.9	0.2	−0.3	0.4	0.3	−2.5	0.4	0.5
					−5.4	−2.4	1.7	3.6	2.3	−0.2	−0.1	1.2	2.7	−1.2	−0.5	−1.6
				55. PACIFIC: Solomon Islands, New Britain, New Guinea												
Guadalcanal (SI)[5]	9°25S	159°59E	1947–49(3)	3	−3.5	−2.1	2.6	8.5	9.5	0.5	−5.0	−3.8	−2.3	−1.4	−0.3	−2.9
Rabaul (NB)[5,11]	4°13S	152°12E	1948–50(3)	2		3.0	7.8	7.6	3.9	0.0	−5.8	−4.9	−0.3			
Dregor Harbor (NG)[5]	6°39S	147°52E	July 1948–Oct. 1949(2)	2	−3.6	−2.4	−2.1	4.9	4.9	−0.9	−0.6	0.2	1.4	0.3	0.3	−2.7
Port Moresby (NG)	9°26S	147°06E	July 1939–June 1940(2)	1	−0.1	3.4	9.7	10.3	9.8	11.3	−4.7	−12.2	−5.2	−9.7	−6.4	−5.7
				k = .37	−2.7	0.0	4.1	8.0	7.5	2.3	−4.2	−4.9	−1.7	−3.1	−1.7	−3.6
				P_g	9.5	9.1	10.8	11.5	12.2	12.5	12.8	12.5	12.5	11.8	11.5	9.1
				c	−1.3	−1.7	−0.4	0.3	1.0	0.6	0.4	0.8	0.7	0.6	0.5	−1.2
				±1.37	−4.0	−1.7	3.7	8.3	8.5	2.9	−3.8	−4.1	−1.0	−2.5	−1.2	−4.8
				56a. PACIFIC OCEAN: Banda Sea												
Amboina (NEI)	3°42S	128°12E	1929–31(1)	3	1.0	4.6	6.9	5.2	−0.5	−2.7	−6.7	−8.6	−7.0	−1.1	4.0	5.1
				k = .58												
				P_g	8.5	9.1	9.1	9.1	10.1	10.8	11.8	10.8	11.5	11.2	9.1	9.1
				c	−1.0	−0.4	−0.8	−0.8	0.2	0.2	0.7	0.4	1.0	1.3	−0.6	0.1
					0.0	4.2	6.1	4.4	−0.3	−2.5	−6.0	−8.2	−6.0	0.2	3.4	5.2
				56b. PACIFIC OCEAN: Celebes Island, South												
Makassar (NEI)[12]	5°06S	119°24E	1925–31(1)	7	8.7	9.6	9.9	6.4	−1.8	−6.1	−8.9	−10.7	−6.9	−5.0	1.0	4.0
				k = .38												
				P_g	8.5	9.1	9.1	9.1	10.1	10.8	11.8	10.8	11.5	11.2	9.1	9.1
				c	−1.0	−0.4	−0.8	−0.8	0.2	0.2	0.7	0.4	1.0	1.3	−0.6	0.1
					7.7	9.2	9.1	5.6	−1.6	−5.9	−8.2	−10.3	−5.9	−3.7	0.4	4.1

				56c. PACIFIC OCEAN: Java, East												
Djamoeanrif (NEI)	6°58S	112°45E	1925–31(1)	7	2.1	0.8	0.5	−4.0	−9.3	−5.2	1.3	3.4	4.6	3.0	−0.3	2.8
Sembilangan (NEI)	7°06S	112°42E	1925–31	7	2.4	3.1	1.0	−4.4	−10.2	−6.2	0.4	2.8	4.6	3.3	0.2	3.0
Soerabaja (NEI)	7°12S	112°36E	1925–31(1)	7	1.2	3.4	1.5	−4.3	−9.8	−6.1	0.1	2.2	4.5	4.2	0.5	2.7
				k = .21	1.9	2.4	1.0	−4.2	−9.8	−5.8	0.6	2.8	4.6	3.5	0.1	2.8
				P_g	8.5	9.1	9.1	9.1	10.1	10.8	11.8	10.8	11.5	11.2	9.1	9.1
				c	−1.0	−0.4	−0.8	−0.8	0.2	0.2	0.7	0.4	1.0	1.3	−0.6	0.1
				±.28	0.9	2.0	0.2	−5.0	−9.6	−5.6	1.3	3.2	5.6	4.7	−0.4	2.9
				56d. PACIFIC OCEAN: Java Sea, South												
Toeban (NEI)	6°53S	112°03E	1929–31(1)	3	−7.4	−3.9	−2.0	3.2	12.3	8.5	1.1	−1.8	−4.9	−1.8	0.1	−4.0
Semarang (NEI)	7°00S	110°24E	1925–31	7	−2.6	−3.8	−3.8	2.3	8.3	6.6	−0.1	−1.3	−2.2	−1.8	−0.3	−2.4
Pekalongan (NEI)	6°52S	109°40E	1926–31	6	−4.0	−4.5	−2.2	2.8	9.8	7.9	0.9	−1.9	−3.0	−2.2	−1.1	−2.6
Tegal (NEI)	6°51S	109°07E	1926–31	6	−9.7	−7.0	−3.3	2.8	10.8	11.5	4.4	2.1	0.1	−1.3	−3.1	−7.9
Cheribon (NEI)	6°43S	108°34E	1925–31(2)	7	−6.1	−6.3	−4.4	3.1	9.8	8.5	0.9	0.2	−2.1	−0.6	0.6	−3.9
Tandjong-Priok (NEI)	6°06S	106°54E	1925–31(1)	7	−6.8	−5.9	−5.7	0.7	9.3	5.5	1.0	0.7	2.3	1.2	1.5	−3.7
Batavia (NEI)	6°10S	106°40E	1927–31(2)	5	−8.1	−8.5	−8.3	2.5	9.7	8.1	1.0	3.4	2.1	1.6	1.2	−4.9
				k = .16	−6.2	−5.6	−4.3	2.4	9.8	7.9	1.2	0.1	−1.0	−0.6	0.0	−4.0
				P_g	8.5	9.1	9.1	9.1	10.1	10.8	11.8	10.8	11.5	11.2	9.1	9.1
				c	−1.0	−0.4	−0.8	−0.8	0.2	0.2	0.7	0.4	1.0	1.3	−0.6	0.1
				±.62	−7.2	−6.0	−5.1	1.6	10.0	8.1	2.6	0.5	0.0	0.7	−0.6	−3.9
				56. PACIFIC OCEAN: Sunda Islands Summary												
				k = .12	−1.9	−1.2	−0.7	1.0	2.4	1.9	−0.5	−0.7	−0.4	0.1	0.4	−0.6
				c	−1.0	−0.4	−0.8	−0.8	0.2	0.2	0.7	0.4	1.0	1.3	−0.6	0.1
				±1.42	−2.9	−1.6	−1.5	0.2	2.6	2.1	0.2	−0.3	0.6	1.4	−0.2	−0.5
				57a. PACIFIC OCEAN: Borneo, South												
Bandjermasin (NEI)	3°18S	114°36E	1927–31	5	14.0	10.8	8.7	4.8	1.7	−7.3	−13.1	−18.7	−18.7	−8.5	4.6	22.2
S. Moesangketjil (NEI)	3°30S	114°30E	1930–31(1)	2	5.6	5.5	4.5	−0.3	2.6	−1.7	−5.6	−11.9	−11.8	−3.9	4.5	12.4
				k = .39	11.2	9.0	7.3	3.1	2.0	−5.4	−10.6	−16.4	−16.4	−7.0	4.6	18.9
				P_g	10.8	10.8	10.8	9.1	9.1	9.8	10.1	9.1	10.8	10.5	9.8	10.8
				c	1.2	1.2	0.8	−0.9	−0.9	−0.9	−1.1	−1.4	0.2	0.5	0.0	1.7
				±2.02	12.4	10.2	8.1	2.2	1.1	−6.3	−11.7	−17.8	−16.2	−6.5	4.6	20.6

57b. PACIFIC OCEAN: Karimata Strait

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Oepang (NEI)[21]	2°45S	104°58E	1928–31(3)	4	29.7	25.9	29.0	16.8	3.0	−20.7	−35.7	−33.8	−26.1	−14.6	5.9	20.8
Soengsang (NEI)	2°20S	104°45E	1928–31	4	12.7	9.3	4.8	0.8	−1.1	−4.6	−13.0	−15.2	−13.5	0.5	6.5	13.0
				k = .35	21.2	17.6	16.9	8.8	1.0	−12.6	−24.3	−24.5	−19.8	−7.0	6.2	16.9
				P_g	10.8	10.8	10.8	9.1	9.1	9.8	10.1	9.1	10.8	10.5	9.8	10.8
				c	1.2	1.2	0.8	−0.9	−0.9	−0.9	−1.1	−1.4	0.2	0.5	0.0	1.7
				±5.58	22.4	18.8	17.7	7.9	0.1	−13.5	−25.4	−25.9	−19.6	−6.5	6.2	18.6

57c. PACIFIC OCEAN: Sumatra, East

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Tambilahan (NEI)[21]	0°20S	103°09E	1928–30	3	11.9	4.6	12.4	−3.2	−4.5	−9.9	−12.3	−13.8	−8.6	1.6	11.0	11.0
Prigi-Radja (NEI)	0°15S	103°15E	1929–31(1	3	5.1	4.3	4.5	−6.2	−7.6	−3.6	−7.4	−7.5	−2.9	3.5	9.7	7.7
				k = .41	8.5	4.4	8.4	−4.7	−6.0	−6.8	−9.8	−10.6	−5.8	2.6	10.4	9.4
				P_g	10.8	10.8	10.8	9.1	9.1	9.8	10.1	9.1	10.8	10.5	9.8	10.8
				c	1.2	1.2	0.8	−0.9	−0.9	−0.9	−1.1	−1.4	0.2	0.5	0.0	1.7
				±1.71	9.7	6.0	7.6	−3.6	−13.3	−14.8	−16.3	−12.2	−5.1	3.8	26.9	11.5

57d. PACIFIC OCEAN: Singapore

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Johore Bahru (Ma)	1°27N	103°46E	Dec. 1923–Nov. 1924 (2), Feb. 1929–Jan. 1930(2)	2	8.5	4.8	6.8	−2.7	−12.4	−13.9	−15.2	−10.8	−5.3	3.3	26.9	9.8
				k = .71												
				P_g	10.8	10.8	10.8	9.1	9.1	9.8	10.1	9.1	10.8	10.5	9.8	10.8
				c	1.2	1.2	0.8	−0.9	−0.9	−0.9	−1.1	−1.4	0.2	0.5	0.0	1.7
					9.7	6.0	7.6	−3.6	−13.3	−14.8	−16.3	−12.2	−5.1	3.8	26.9	11.5

57e. PACIFIC OCEAN: Gulf of Siam

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Prachuap Kirikhan (Si)	11°48N	99°49E	1910–15(2), 1940–45	12	15.9	13.9	7.5	−0.5	−9.3	−20.1	−22.5	−18.7	−12.9	6.5	19.5	20.3
Bangkok Bar (Si)	13°29N	100°34E	1926–45	19	8.4	11.7	8.9	−0.6	−8.6	−15.0	−13.8	−11.5	−9.2	3.6	13.0	13.1
Fort Phrachula Chomklao (Si)	13°33N	100°35E	1940–45	6	5.8	9.9	6.4	−1.5	−3.0	−12.7	−12.3	−7.6	−7.8	3.4	9.6	9.7
Kọ Sichang (Si)	13°09N	100°49E	1940–46	7	12.0	14.9	8.8	1.0	−7.7	−16.9	−14.0	−9.2	−7.5	−2.1	8.2	11.9
				k = .16	10.7	12.8	8.1	−0.3	−7.6	−16.4	−15.8	−12.1	−9.5	2.9	12.9	14.0
				P_g	10.8	10.8	10.8	9.1	9.1	9.8	10.1	9.1	10.8	10.5	9.8	10.8
				c	1.2	1.2	0.8	−0.9	−0.9	−0.9	−1.1	−1.4	0.2	0.5	0.0	1.7
				±1.50	11.9	14.0	8.9	−1.2	−8.5	−17.3	−16.9	−13.5	−9.3	3.4	12.9	15.7

57. PACIFIC OCEAN: Karimata Strait and Gulf of Siam, Summary

			k = .13	12.1	11.4	9.5	0.8	−4.9	−12.7	−15.5	−14.4	−11.3	−0.1	10.9	14.2
			c	1.2	1.2	0.8	−0.9	−0.9	−0.9	−1.1	−1.4	0.2	0.5	0.0	1.7
			±1.79	13.3	12.6	10.3	−0.1	−5.8	−13.6	−16.6	−15.8	−11.1	0.4	10.9	15.9

58a. PACIFIC OCEAN: Celebes Sea, South

Menado (NEI)	1°32N 124°50E	1927–31	5	1.6	−0.8	3.1	4.1	1.4	−0.3	0.8	−3.4	−5.0	−2.2	−0.9	1.6
			k = .45												
			P_g	10.8	10.1	10.8	10.5	10.1	10.8	10.5	9.8	9.8	11.2	9.5	10.8
			c	0.8	0.8	0.8	0.1	0.1	−0.6	−1.1	−1.8	−1.2	0.8	−0.4	1.7
				2.4	0.0	3.9	4.2	1.5	−0.9	−0.3	−5.2	−6.2	−1.4	−1.3	3.3

58b. PACIFIC OCEAN: Celebes Sea, North

Zamboanga (PI)	6°54N 122°04E	1922–23(1), 1927(1)	3	6.1	1.2	4.3	0.9	0.6	0.6	−4.0	−2.7	−2.1	0.0	−1.8	−2.7
			k = .58												
			P_g	10.8	10.1	10.8	10.5	10.1	10.8	10.5	9.8	9.8	11.2	9.5	10.8
			c	0.8	0.8	0.8	0.1	0.1	−0.6	−1.1	−1.8	−1.2	0.8	−0.4	1.7
				6.9	2.0	5.1	1.0	0.7	0.0	−5.1	−4.5	−3.3	0.8	−2.2	−1.0

58c. PACIFIC OCEAN: Sulu Archipelago

Jolo (PI)	6°04N 121°00E	1924–27(3), 1930(1)	5	−4.6	−3.4	4.6	1.5	1.2	0.6	0.9	−0.6	−0.3	0.9	1.2	−3.4
			k = .45												
			P_g	10.8	10.1	10.8	10.5	10.1	10.8	10.5	9.8	9.8	11.2	9.5	10.8
			c	0.8	0.8	0.8	0.1	0.1	−0.6	−1.1	−1.8	−1.2	0.8	−0.4	1.7
				−3.8	−2.6	5.4	1.6	1.3	0.0	−0.2	−2.4	−1.5	1.7	0.8	−1.7

58. PACIFIC OCEAN: Celebes Sea Summary

			k = .28	1.0	−1.0	4.0	2.2	1.1	0.3	−0.8	−2.2	−2.5	−0.4	−0.5	−1.5
			c	0.8	0.8	0.8	0.1	0.1	−0.6	−1.1	−1.8	−1.2	0.8	−0.4	1.7
			±1.10	1.8	−0.2	4.8	2.3	1.2	−0.3	−1.9	−4.0	−3.7	0.4	−0.9	0.2

59a. PACIFIC OCEAN: Luzon

Manila (PI)	14°35N 120°58E	1901–20(1), 1926–34 (2), 1935–38	30	−12.0	−12.5	−9.5	−5.0	−0.9	3.4	10.0	13.9	12.5	7.2	−0.6	−6.5
			k = .18												
			P_g	13.2	12.8	12.5	10.5	10.5	9.8	9.5	7.8	9.1	11.5	11.8	12.2
			c	2.8	2.4	1.7	−0.3	−0.3	−1.7	−2.5	−3.5	−2.3	0.7	1.2	2.3
				−9.2	−10.1	−7.8	−5.3	−1.2	1.7	7.5	10.4	10.2	7.9	0.6	−4.2

59b. PACIFIC OCEAN: San Bernardino Strait

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Port San Miguel (PI)	12°40N	123°35E	1914–15(2)	2	−10.1	−9.8	−8.2	−5.2	1.2	3.4	7.9	11.6	11.9	6.1	−2.7	−6.4
Biri Island (PI)	12°39N	124°22E	1926–27(2)	2	−7.9	−6.1	1.2	3.4	3.1	1.2	6.1	4.6	3.4	5.5	−6.7	−7.9
Batuan Bay (PI)	12°25N	123°47E	1926–27(2)	2	−11.6	−9.2	−2.1	3.1	5.2	3.7	2.7	5.8	6.7	7.6	−3.1	−8.8
				k = .41	−9.9	−8.4	−3.0	0.4	3.2	2.8	5.6	7.3	7.3	6.4	−4.2	−7.7
				P_g	13.2	12.8	12.5	10.5	10.5	9.8	9.5	7.8	9.1	11.5	11.8	12.2
				c	2.8	2.4	1.7	−0.3	−0.3	−1.7	−2.5	−3.5	−2.3	0.7	1.2	2.3
				±1.41	−7.1	−6.0	−1.3	0.1	2.9	1.1	3.1	3.8	5.0	7.1	−3.0	−5.4

59c. PACIFIC OCEAN: Sebu

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Oloilo (PI)	10°42N	122°34E	1903–09(4)	7	−9.8	−9.2	−6.1	−1.2	1.8	4.0	7.3	7.0	5.8	4.0	0.9	−4.6
Sebu (PI)	10°18N	123°54E	1935–40(1)	6	−9.4	−10.3	−6.4	−2.7	1.6	4.9	7.1	8.0	7.7	4.3	0.3	−5.2
				k = .28	−9.6	−9.6	−6.2	−1.8	1.7	4.4	7.2	7.4	6.6	4.1	0.7	−4.8
				P_g	13.2	12.8	12.5	10.5	10.5	9.8	9.5	7.8	9.1	11.5	11.8	12.2
				c	2.8	2.4	1.7	−0.3	−0.3	−1.7	−2.5	−3.5	−2.3	0.7	1.2	2.3
				±.32	−6.8	−7.2	−4.5	−2.1	1.4	2.7	4.7	3.9	4.3	4.8	1.9	−2.5

59. PACIFIC OCEAN: Philippine Islands, East, Summary

	J	F	M	A	M	J	J	A	S	O	N	D
k = .17	−10.6	−10.4	−6.7	−2.5	1.0	3.6	7.9	9.8	9.0	5.8	−0.9	−6.1
c	2.8	2.4	1.7	−0.3	−0.3	−1.7	−2.5	−3.5	−2.3	0.7	1.2	2.3
±.92	−7.8	−8.0	−5.0	−2.8	0.7	1.9	5.4	6.3	6.7	6.5	0.3	−3.8

60. PACIFIC: Philippine Islands, West

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Puerto Princesa (PI)	9°44N	118°43E	1916–18(1)	3	6.5	−4.4	−4.8	−5.4	−6.6	−6.9	−4.2	−2.3	11.4	6.2	6.8	3.8
Araceli (PI)	10°35N	119°59E	1913–15(3)	3	−4.2	−6.6	−5.7	−4.5	−4.2	−3.0	−1.4	5.6	11.4	10.5	1.3	1.0
Port Uson (PI)	12°01N	120°12E	1912–16(2)	5	−3.9	−6.9	−7.2	−6.6	−4.5	−2.3	3.5	5.9	7.4	6.8	4.1	3.2
				k = .30	−0.5	−6.0	−5.9	−5.5	−5.1	−4.1	−0.7	3.1	10.1	7.8	4.1	2.7
				P_g	12.5	11.8	11.8	10.8	10.1	9.8	9.8	8.5	9.1	11.5	10.8	11.8
				c	2.3	1.6	1.2	0.2	−0.5	−1.5	−2.0	−2.6	−2.1	0.9	0.4	2.1
				±1.41	1.8	−4.4	−4.7	−5.3	−5.6	−5.6	−2.7	0.5	8.0	8.7	4.5	4.8

61. PACIFIC: South China Sea

Macao (Ch)	22°12N	113°33E	1937–46	10	−2.8	−4.3	−4.6	−8.1	−5.3	−5.2	−2.8	1.1	7.9	14.0	7.8	2.0
Hong Kong (Ch)	22°18N	114°10E	May 1929–Apr. 1930(2)	1	−1.0	−8.5	−5.9	−8.4	−5.3	−14.2	−1.7	−0.5	12.7	23.3	13.7	−3.1
				k = .34	−2.4	−5.4	−4.9	−8.2	−5.3	−7.5	−2.5	0.7	9.1	16.3	9.0	0.7
				P_g	22.0	21.0	18.3	13.5	9.1	7.1	5.4	6.8	9.8	15.2	19.3	21.0
				c	8.5	7.5	4.4	−0.4	−4.8	−7.5	−9.7	−7.6	−4.7	1.3	5.6	8.0
				±1.45	6.1	2.1	−0.5	−8.6	−10.1	−15.0	−12.2	−6.9	4.4	17.6	14.6	8.7

62. PACIFIC: Formosa

Takao (Fo)	22°37N	120°16E	1904–43(1)	40	−12.6	−11.4	−6.7	−4.3	−0.4	4.7	10.4	12.9	10.7	7.1	−0.2	−9.9
Kirun (Fo)	25°09N	121°45E	1904–24(3)	21	−13.2	−12.3	−10.0	−6.0	1.9	8.9	14.7	17.8	14.4	3.3	−5.6	−13.5
				k = .14	−12.9	−11.8	−8.2	−5.1	0.6	6.6	12.4	15.1	12.4	5.4	−2.7	−11.4
				P_g	20.6	20.0	17.6	13.9	9.8	7.8	6.1	6.8	9.1	13.5	19.3	20.8
				c	7.3	6.7	3.9	0.2	−3.9	−6.6	−8.8	−7.4	−5.2	−0.2	5.8	7.5
				±1.25	−5.6	−5.1	−4.3	−4.9	−3.3	0.0	3.6	7.7	7.2	5.2	3.1	−3.9

63. PACIFIC: China

Yang-tsi-Kiang (Ch)	30°49N	122°38E	1923	1	−14.5	−13.6	−17.1	−9.0	0.9	6.3	10.0	10.3	25.7	11.9	0.5	−11.4
Shanghai (Ch)	31°24N	121°30E	1930	1	−36.9	−18.4	−14.9	−4.8	2.7	17.8	23.9	13.5	21.9	12.5	−5.8	−11.5
				k = .70	−25.7	−16.0	−16.0	−6.9	1.8	12.1	16.9	11.9	23.8	12.2	−2.7	−11.5
				P_g	26.5	24.5	21.0	15.0	11.7	7.0	5.8	6.3	12.5	19.5	23.7	26.0
				c	10.4	8.4	4.5	−1.5	−4.8	−10.2	−11.9	−10.7	−4.6	3.0	7.4	10.4
				±3.13	−15.3	−7.6	−11.5	−8.4	−3.0	1.9	5.0	1.2	19.2	15.2	4.7	−1.1

64. PACIFIC: China, Yellow Sea

Newchwang (Ch)	40°38N	122°10E	Feb. 1924–Jan. 1925(2)	1	−11.7	−28.5	−17.3	−7.4	4.2	16.4	31.3	27.1	14.7	3.9	−13.0	−19.7
				k = 1.00												
				P_g	29.4	26.5	21.5	15.0	10.0	5.4	5.0	7.0	15.0	20.5	24.7	27.6
				c	12.6	9.7	4.3	−2.2	−7.2	−12.5	−13.4	−10.7	−2.8	3.3	7.7	11.3
					0.9	−18.8	−13.0	−9.6	−3.0	3.9	17.9	16.4	11.9	7.2	−5.3	−8.4

65. PACIFIC: Korea

Genzan (Ko)[12, 13]	39°10N	127°27E	1932–44	13	−12.9	−13.2	−10.7	−7.1	0.8	9.1	13.5	17.5	14.3	2.2	−5.3	−8.3
				k = .28												
				P_g	25.8	23.4	19.8	14.5	10.8	6.5	6.5	8.0	14.0	19.5	22.8	24.5
				c	10.0	7.6	3.6	−1.7	−5.4	−10.4	−10.9	−8.7	−2.8	3.3	6.8	9.2
					−2.9	−5.6	−7.1	−8.8	−4.6	−1.3	2.6	8.8	11.5	5.5	1.5	0.9

66. PACIFIC: Japan, Oyashio

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Hanasaki (Ja)	43°17N	145°35E	1900–24(1)	25	4.7	−0.5	−3.0	−6.5	−3.5	−1.9	0.0	2.9	2.5	−0.6	−0.2	6.4
Honto (Ja)[13]	46°41N	141°51E	1922–44(1)	23	2.2	−3.0	−4.7	−5.0	−2.2	−0.3	3.0	3.4	0.1	−1.3	1.9	5.4
				k = .14	3.4	−1.8	−3.8	−5.8	−2.8	−1.1	1.5	3.2	1.3	−1.0	0.8	5.9
				P_g	13.0	13.5	13.5	13.0	11.0	9.5	9.5	11.0	13.5	15.0	13.5	12.5
				c	1.1	1.6	1.2	0.7	−1.3	−3.5	−4.0	−1.8	0.6	2.7	1.4	1.1
				±.67	4.5	−0.2	−2.6	−5.1	−4.1	−4.6	−2.5	1.4	1.9	1.7	2.2	7.0

67. PACIFIC: Japan, North Kuroshio

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Wazima (Ja)[13]	37°24N	136°54E	1900–49	50	−5.3	−11.5	−14.5	−15.4	−5.9	2.7	10.3	15.1	12.8	6.7	4.5	1.0
Iwasaki (Ja)	40°35N	139°55E	1900–24	25	−6.2	−11.3	−14.5	−11.9	−4.8	2.2	9.0	14.8	10.5	5.4	4.9	1.5
Osyoro (Ja)[13]	43°13N	140°52E	1930–49(2)	20	−4.9	−8.5	−10.5	−7.7	−1.8	2.4	8.1	10.7	8.3	3.4	1.8	−1.2
Otaru (Ja)	43°13N	141°03E	1906–33	28	−5.8	−9.7	−10.0	−8.6	−2.4	3.2	8.2	12.2	8.4	3.6	2.1	−0.8
				k = .09	−5.6	−10.5	−12.7	−11.5	−4.0	2.6	9.1	13.5	10.3	5.0	3.5	0.3
				P_g	17.5	17.0	16.0	14.3	12.0	9.5	9.5	10.0	13.0	17.0	18.0	17.0
				c	3.7	3.2	2.8	0.1	−2.2	−5.4	−5.9	−4.7	−1.8	2.8	4.0	3.7
				±.81	−1.9	−7.3	−9.9	−11.4	−6.2	−2.8	3.2	8.8	8.5	7.8	7.5	4.0

68. PACIFIC: Japan, China Sea

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Hukabori (Ja)	32°41N	129°49E	1900–24	25	−15.3	−16.9	−13.3	−9.0	−2.2	5.8	12.5	21.6	18.5	10.2	0.0	−11.6
Hamada (Ja)	34°55N	132°04E	1900–24	25	−13.1	−16.6	−16.7	−13.7	−3.8	6.6	15.0	21.4	15.6	9.4	2.4	−6.2
				k = .14	−14.2	−16.8	−15.0	−11.4	−3.0	6.2	13.8	21.5	17.1	9.8	1.2	−8.9
				P_g	23.0	21.0	19.4	15.5	12.0	8.5	8.5	8.2	12.5	18.2	21.5	22.5
				c	7.6	5.6	3.6	−0.3	−3.8	−8.0	−8.5	−8.1	−3.9	2.8	5.9	7.6
				±.98	−6.6	−11.2	−11.4	−11.7	−6.8	−1.8	5.3	13.4	13.2	12.6	7.1	−1.3

				69. PACIFIC: Japan, Kuroshio												
Hososima (Ja)[13]	32°25N	131°40E	1900–49	50	−12.7	−12.7	−11.4	−8.6	−4.0	5.3	8.3	14.5	13.4	10.7	5.1	−7.5
Osaki Wan (Ja)[14]	34°08N	135°08E	1926–33(2)	8	−14.2	−15.8	−15.1	−9.0	−2.9	6.9	10.4	16.9	9.7	12.6	3.5	−3.6
Kusimoto (Ja)	33°28N	136°47E	1900–24	25	−10.9	−11.7	−12.2	−9.1	−2.4	4.9	8.4	14.3	13.7	11.1	1.1	−6.6
Aburatubo (Ja)[13]	35°09N	139°37E	1900–45(1), 1947–49(2)	49	−4.2	−6.3	−9.2	−8.5	−3.4	1.4	3.6	6.6	9.0	7.6	3.5	0.2
Aikawa (Ja)	38°18N	141°30E	1900–24(2)	25	−3.1	−7.3	−11.5	−11.8	−5.4	0.3	5.4	9.9	10.5	7.5	4.2	1.7
				k = .08	−8.6	−10.2	−11.4	−9.3	−3.7	3.5	6.8	11.8	11.4	9.6	3.6	−3.2
				P_g	19.0	18.0	17.5	15.0	12.0	9.5	9.5	9.0	12.0	17.0	20.0	20.0
				c	4.6	3.6	2.7	0.2	−2.8	−6.0	−6.5	−6.3	−3.4	2.2	5.4	6.1
				±1.18	−4.0	−6.6	−8.7	−9.1	−6.5	−2.5	0.3	5.5	8.0	11.8	9.0	2.9
				70. PACIFIC: New Zealand, North												
Auckland (NZ)	36°51S	174°49E	Sept. 1917–Aug. 1919 (2), 1921–23, 1937, 1941	7	1.5	0.3	3.1	1.5	3.6	5.2	0.0	−2.4	−4.6	−2.7	−4.6	−0.6
Wellington (NZ)	41°17S	174°48E	Sept. 1918–Aug. 1919 (2), 1921–24, 1927, 1930, 1937, 1939, 1942	10	1.8	−0.3	1.2	0.2	1.5	3.6	0.2	−1.6	−3.4	−1.9	−1.6	0.2
				k = .24	1.6	0.0	2.2	0.8	2.6	4.4	0.1	−2.0	−4.0	−2.3	−3.1	−0.2
				P_g	11.8	14.2	15.9	15.9	13.9	10.8	11.5	11.2	13.9	12.8	12.5	10.8
				c	−0.6	1.8	3.1	3.1	1.1	−2.7	−2.5	−2.1	0.5	0.0	−0.1	−1.1
				±.51	1.0	1.8	5.3	3.9	3.7	1.7	−2.4	−4.1	−3.5	−2.3	−3.2	−1.3
				71. PACIFIC: New Zealand, South												
Port Lyttelton (NZ)	43°36S	172°51E	1923–27	5	2.1	7.6	4.2	3.9	4.2	2.1	−2.2	−2.5	−4.0	−3.7	−3.4	−7.7
Dunedin (NZ)	45°53S	170°33E	1923–27, 1937	6	3.4	3.7	1.2	1.9	2.7	−1.8	0.0	−2.1	−3.3	−3.0	−1.8	−1.5
Bluff (NZ)	46°35S	168°22E	1917–22(3)	5	−5.0	1.1	5.9	3.2	1.3	−2.3	−2.0	−2.3	−3.8	2.3	−0.5	2.3
				k = .25	0.2	4.1	3.8	3.0	2.7	−0.7	−1.4	−2.3	−3.7	−1.5	−1.9	−2.3
				P_g	6.8	10.1	12.5	15.9	8.8	7.1	7.8	5.4	9.8	10.1	5.7	4.4
				c	−1.4	1.9	3.9	7.3	0.2	−2.2	−2.0	−3.7	0.6	1.5	−2.7	−3.3
				±1.26	−1.2	6.0	7.7	10.3	2.9	−2.9	−3.4	−6.0	−3.1	0.0	−4.6	−5.6

72. PACIFIC: Australia, East Coast

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Ballina (Au)	28°52S	153°37E	1928–38(5)	11	1.3	0.4	−1.1	8.4	9.3	4.4	−0.8	−2.9	−5.7	−5.1	−2.9	−5.1
Yamba (Au	29°36S	153°21E	1928–36(9)	9	−2.0	3.2	1.9	5.3	8.9	10.5	5.9	1.6	−6.9	−11.2	−7.5	−10.0
				k = .24	−0.4	1.8	0.4	6.8	9.1	7.4	2.6	−0.6	−6.3	−8.2	−5.2	−7.6
				P_g	11.2	12.5	14.9	16.2	16.6	16.9	18.3	17.9	16.9	15.9	12.8	10.5
				c	−3.4	−2.1	−0.1	1.2	1.6	1.2	2.1	2.4	1.3	0.9	−2.0	−3.6
				±1.53	−3.8	−0.3	0.3	8.0	10.7	8.6	4.7	1.8	−5.0	−7.3	−7.2	−11.2

73. PACIFIC: Australia, Southeast Coast

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Newcastle (Au)	32°55S	151°48E	1928–38	11	−1.1	−0.2	0.6	4.3	2.6	5.9	1.3	−3.1	−1.9	−4.0	−4.5	−0.3
Sydney (Au)	33°51S	151°14E	1897–1927, 1934, 1937–38	33	0.7	−1.6	1.3	4.4	5.1	2.7	−0.4	−3.8	−3.6	−2.4	−2.5	−0.3
Williamstown (Au)	37°52S	144°55E	1928–39(1), 1943–44(2)	13	−0.3	−2.3	−2.8	3.9	3.0	3.6	1.3	1.1	−1.4	−1.9	−3.9	−0.6
				k = .14	0.0	−1.5	−0.1	4.2	3.9	3.7	0.5	−2.1	−2.5	−2.6	−3.4	−0.4
				P_g	12.5	14.2	15.9	18.6	15.6	15.2	19.3	14.5	14.5	13.9	12.5	10.8
				c	−1.8	−0.1	1.2	3.9	0.9	−0.2	3.4	−0.7	−0.8	−0.8	−2.0	−3.0
				±.65	−1.8	−1.6	1.1	8.1	4.8	3.5	3.9	−2.8	−3.3	−3.4	−5.4	−3.4

74. INDIAN OCEAN: Australia, South, I

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
Port Phillip Heads (Au)	38°18S	144°37E	1927–29(2), 1931	3	−2.7	−10.4	−9.1	0.9	4.6	6.9	11.3	3.7	7.0	1.7	−5.5	−8.1
Beachport (Au)	37°30S	140°00E	1927–31	5	−4.3	−9.6	−6.0	3.2	4.9	6.3	8.1	5.2	5.6	−1.8	−6.2	−5.3
Robe (Au)	37°09S	139°45E	July 1945–June 1946(2)	1	4.1	−7.7	−2.7	−7.0	9.9	0.5	−6.3	13.1	5.6	−4.8	1.8	−6.6
Port Adelaide (Au)	34°51S	138°30E	1882–91, 1933–37, 1941–45	21	−1.9	−8.0	−4.3	−0.9	5.5	9.4	6.0	3.9	1.2	−2.2	−6.4	−2.2
Second Valley (Au)	35°31S	138°10E	1938–42(1)	5	−7.1	−7.2	−4.3	−2.0	8.5	14.2	6.1	11.1	4.5	−9.6	−6.6	−7.0
				k = .19	−2.8	−8.5	−5.2	−0.6	6.1	8.5	6.3	6.0	3.8	−2.9	−5.6	−4.9
				P_g	12.5	14.2	16.6	19.3	15.9	16.2	19.3	16.6	15.9	15.2	12.8	11.5
				c	−2.5	−0.8	1.2	3.9	0.5	0.1	2.7	0.7	−0.1	−0.2	−2.4	−3.0
				±1.24	−5.3	−9.3	−3.0	3.3	6.6	8.6	9.0	6.7	3.7	−3.1	−8.0	−7.9

75. INDIAN OCEAN: Australia, South, II

Stenhouse Bay (Au)	35°15S	136°58E	1942–46(1)	5	−5.5	−5.8	−3.6	−0.6	8.5	9.1	7.9	4.3	3.4	−5.5	−5.8	−5.8
Port Wallaroo (Au)	33°56S	137°38E	1933–37	5	0.5	−4.5	−3.2	2.6	6.9	4.8	4.1	2.5	0.1	−2.8	−7.3	−3.9
Port Pirie (Au)	33°09S	138°01E	1933–37(1), 1941–45	10	0.8	−4.0	−1.0	0.0	4.8	3.6	5.0	−0.6	−0.6	−4.4	−3.4	−0.4
Whyalla (Au)	33°01S	137°34E	1943–46(1)	4	9.1	0.9	−0.6	0.0	3.6	1.5	−0.6	−6.7	−3.3	−6.1	1.2	1.8
				k = .21	1.2	−3.4	−2.0	0.4	5.8	4.7	4.2	−0.2	−0.2	−4.7	−3.8	−1.9
				P_g	11.5	13.5	16.2	19.3	16.2	16.6	19.6	17.2	16.6	15.9	12.8	12.2
				c	−3.6	−1.6	0.7	3.8	0.7	0.4	2.9	1.2	0.5	0.4	−2.5	−2.4
				±1.37	−2.4	−5.0	−1.3	4.2	6.5	5.1	7.1	1.0	0.3	−4.3	−6.3	−4.3

76. INDIAN OCEAN: Australia, Southwest

Franklyn Harbour (Au)	33°41S	136°56E	1935–39	5	−2.5	−1.7	−3.3	1.8	7.8	6.1	0.0	5.7	−5.2	−3.1	−4.5	−1.7
Port Lincoln (Au)	34°49S	135°52E	1920–24	5	−9.2	−7.3	−8.2	−5.5	2.4	11.3	11.6	4.9	−0.6	0.9	−1.5	0.0
Thevenard (Au)	32°09S	133°39E	1934–36, 1940–42	6	−6.7	−5.2	−0.9	0.9	7.6	6.4	8.8	5.5	4.3	−9.2	−6.1	−5.2
Albany (Au)	35°02S	117°54E	Oct. 1923–Sept. 1924(2)	1	−7.6	−7.2	−3.6	7.5	20.5	15.0	9.8	5.8	−3.3	−8.8	−14.1	−14.2
Fremantle (Au)	32°03S	115°44E	1937–38	2	−11.5	−5.7	−1.4	5.0	14.3	12.2	6.4	3.0	−1.7	−6.9	−9.0	−4.8
				k = .24	−7.0	−5.2	−3.7	0.9	8.8	9.4	7.1	5.1	−1.0	−4.8	−5.9	−4.1
				P_g	12.5	13.5	15.9	17.6	16.2	16.6	19.3	16.6	16.9	15.9	13.5	12.5
				c	−2.6	−1.6	0.4	2.1	0.7	0.4	2.6	0.6	0.8	0.4	−1.8	−2.1
				±1.65	−9.6	−6.8	−3.3	3.0	9.5	9.8	9.7	5.7	−0.2	−4.4	−7.7	−6.2

77. INDIAN OCEAN: Australia, West

Port Hedland (Au)	20°18S	118°35E	1913, 1927, 1932–33, 1938(1)	5	−0.7	5.4	17.6	14.5	8.4	−0.7	−6.8	−14.5	−9.9	−7.5	−4.4	−1.1
				k = .45												
				P_g	7.4	8.8	9.8	12.8	13.9	15.9	16.6	16.6	14.5	13.2	10.1	9.1
				c	−4.5	−3.1	−2.5	0.5	1.6	2.9	3.1	3.8	1.6	0.9	−2.0	−2.3
					−5.2	2.3	15.1	15.0	10.0	2.2	−3.7	−10.7	−8.3	−6.6	−6.4	−3.4

78. INDIAN OCEAN: Java, South

Patjitan (NEI)	8°12S	111°05E	1928–31	4	2.8	4.7	6.8	3.8	7.2	−1.8	−10.2	−8.8	−14.4	−0.4	3.3	6.9
Tjilatjap (NEI)	7°44S	109°00E	1925–31	7	6.6	4.1	7.8	6.3	9.9	−4.6	−10.8	−13.2	−16.5	−5.1	6.0	9.1
				k = .30	5.1	4.3	7.4	5.3	8.8	−3.5	−10.6	−11.4	−15.7	−3.2	4.9	8.2
				P_g	8.8	9.1	9.1	9.1	10.1	11.5	12.5	11.2	11.8	11.5	9.1	9.1
				c	−0.9	−0.6	−1.0	−1.0	0.0	0.7	1.2	0.6	1.1	1.4	−0.8	−0.1
				±.98	4.2	3.7	6.4	4.3	8.8	−2.8	−9.4	−10.8	−14.6	−1.8	4.1	8.1

Station	Latitude	Longitude	Years	Tota Years	J	F	M	A	M	J	J	A	S	O	N	D
				79a. INDIAN OCEAN: Java, Southwest												
Plaboean-Ratoe (NEI	7°00S	106°30E	1928–31(1)	4	−0.3	−0.3	1.6	1.5	13.9	0.2	−14.3	−7.8	−10.1	−1.1	7.7	8.7
				k = .50												
				P_g	9.1	9.1	9.1	9.1	9.1	10.8	11.8	10.5	11.5	11.5	9.1	9.1
				c	−0.4	−0.4	−0.8	−0.8	−0.8	0.2	0.7	0.1	1.0	1.6	−0.6	0.1
					−0.7	−0.7	0.8	0.7	13.1	0.4	−13.6	−7.7	−9.1	0.5	7.1	8.8
				79b. INDIAN OCEAN: Sumatra, South												
Oosthaven (NEI)	5°27S	105°16E	1930–31(1)	2	−5.1	−10.2	−5.2	0.3	9.7	2.7	−0.6	−7.3	−7.7	1.0	13.6	9.8
Kroë (NEI)	5°11S	103°55E	1929–31(1)	3	−10.2	−8.1	−3.9	−3.5	13.8	5.1	−2.9	−6.8	−4.6	10.3	10.6	−0.1
				k = .45	−8.5	−8.8	−4.3	−2.2	12.4	4.3	−2.1	−7.0	−5.6	7.2	11.6	3.2
				P_g	9.1	9.1	9.1	9.1	9.1	10.8	11.8	10.5	11.5	11.5	9.1	9.1
				c	−0.4	−0.4	−0.8	−0.8	−0.8	0.2	0.7	0.1	1.0	1.6	−0.6	0.1
				±1.61	−8.9	−9.2	−5.1	−3.0	11.6	4.5	−1.4	−6.9	−4.6	8.8	11.0	3.3
				79c. INDIAN OCEAN: Sumatra, West												
Benkoelen (NEI)	3°47S	102°15E	1925–31	7	−2.7	−9.5	−5.6	−0.3	9.7	0.0	0.5	−2.5	−2.3	4.3	6.9	1.6
Emmahaven (NEI)	0°58S	100°20E	1925–31	7	−6.0	−10.3	−6.0	−1.7	8.4	2.4	1.7	0.1	−0.7	4.8	6.7	1.1
Sibolga (NEI)	1°44N	98°46E	1930–31	2	−7.7	−7.9	−4.3	−2.5	12.0	5.4	−3.0	−3.5	−4.3	4.3	8.0	3.0
				k = .26	−4.8	−9.6	−5.6	−1.2	9.5	1.8	0.8	−1.5	−1.9	4.5	7.0	1.6
				P_g	9.1	9.1	9.1	9.1	9.1	10.8	11.8	10.5	11.5	11.5	9.1	9.1
				c	−0.4	−0.4	−0.8	−0.8	−0.8	0.2	0.7	0.1	1.0	1.6	−0.6	0.1
				±.66	−5.2	−10.0	−6.4	−2.0	8.7	2.0	1.5	−1.4	−0.9	6.1	6.4	1.7
				79d. INDIAN OCEAN: Sumatra, North												
Belawan (NEI)	3°55N	98°43E	1925–31	7	−9.2	−14.9	−10.2	−1.9	9.3	7.8	5.9	5.3	1.6	5.8	3.4	−3.3
				k = .38												
				P_g	9.1	9.1	9.1	9.1	9.1	10.8	11.8	10.5	11.5	11.5	9.1	9.1
				c	−0.4	−0.4	−0.8	−0.8	−0.8	0.2	0.7	0.1	1.0	1.6	−0.6	0.1
					−9.6	−15.3	−11.0	−2.7	8.5	8.0	6.6	5.4	2.6	7.4	2.8	−3.2
				79. INDIAN OCEAN: Java, Southwest, and Sumatra, West, Summary												
				k = .18	−5.8	−9.3	−5.2	−1.2	10.6	3.3	−0.9	−2.1	−3.0	4.6	7.3	1.9
				c	−0.4	−0.4	−0.8	−0.8	−0.8	0.2	0.7	0.1	1.0	1.6	−0.6	0.1
				±1.38	−6.2	−9.7	−6.0	−2.0	9.8	3.5	−0.2	−2.0	−2.0	6.2	6.7	2.0

80a. INDIAN OCEAN: Malacca Strait

Bengkalis (NEI)	1°28N	102°08E	1929–31(1)	3	−4.2	−7.8	−8.5	−6.2	4.0	0.4	−0.9	−0.3	−0.6	7.7	12.2	4.2
				k = .58												
				P_g	10.5	10.5	9.8	9.1	8.8	9.5	10.1	9.1	10.1	10.8	9.1	10.1
				c	1.2	1.2	0.1	−0.6	−0.9	−0.9	−0.8	−1.1	−0.2	1.1	−0.4	1.3
					−3.0	−6.6	−8.4	−6.8	3.1	−0.5	−1.7	−1.4	−0.8	8.8	11.8	5.5

80b. INDIAN OCEAN: Malay Peninsula, West

Bass Harbour (Ma)	6°18N	99°47E	1934	1	−4.5	−11.2	−9.1	0.8	2.9	−1.4	5.6	4.7	4.1	5.7	14.3	−12.1
Ko Ta-Phao Noi (Si)	7°50N	98°26E	1940–46(1)	7	−12.0	−14.7	−11.2	−2.4	6.7	8.1	9.0	2.5	3.6	3.9	5.6	1.4
				k = .39	−10.1	−13.8	−10.7	−1.6	5.8	5.7	8.2	3.0	3.7	4.4	7.8	−2.0
				P_g	10.5	10.5	9.8	9.1	8.8	9.5	10.1	9.1	10.1	10.8	9.1	10.1
				c	1.2	1.2	0.1	−0.6	−0.9	−0.9	−0.8	−1.1	−0.2	1.1	−0.4	1.3
				±1.91	−8.9	−12.4	−10.6	−2.2	4.9	4.8	7.4	1.9	3.5	5.5	7.4	−0.7

80. INDIAN OCEAN: Malacca Strait Summary

k = .32	−8.2	−11.8	−9.9	−3.1	5.2	3.9	5.1	1.9	2.3	5.5	9.3	0.1
c	1.2	1.2	0.1	−0.6	−0.9	−0.9	−0.8	−1.1	−0.2	1.1	−0.4	1.3
±1.88	−7.0	−10.6	−9.8	−3.7	4.3	3.0	4.3	0.8	2.1	6.6	8.9	1.4

81a. INDIAN OCEAN: Burma

Rangoon (Bu)	16°46N	96°10E	1937–41	5	−40.9	−37.9	−34.8	−22.6	−4.4	20.0	32.2	47.5	38.3	26.1	−1.3	−22.6
Akyab (Bu)	20°08N	92°54E	1937–41	5	−33.0	−36.1	−30.0	−11.7	12.7	34.0	34.0	27.9	15.8	6.6	−5.6	−14.7
Chittagong (In)	22°20N	91°50E	1937–46(2)	10	−54.9	−54.9	−42.7	−24.4	9.1	45.7	60.9	64.0	42.6	9.1	−18.3	−36.6
				k = .23	−44.6	−44.7	−36.8	−20.3	6.3	35.0	45.0	49.0	33.7	13.2	−9.8	−26.3
				P_g	14.9	13.2	11.8	7.1	6.1	2.4	3.0	4.7	5.7	9.1	11.8	14.9
				c	6.7	5.0	3.2	−1.5	−2.5	−6.9	−6.8	−4.4	−3.5	0.5	3.4	7.2
				±5.64	−37.9	−39.7	−33.6	−21.8	3.8	28.1	38.2	44.6	30.2	13.7	−6.4	−19.1

81b. INDIAN OCEAN: Kidderpore

Kidderpore (In)[21]	22°32N	88°20E	1881-93(1), 1937-46	23	−60.6	−66.2	−54.8	−41.0	−21.3	−3.0	44.1	97.6	104.3	52.7	−10.5	−41.7
				k = .21												
				P_g	14.9	13.2	11.8	7.1	6.1	2.4	3.0	4.7	5.7	9.1	11.8	14.9
				c	6.7	5.0	3.2	−1.5	−2.5	−6.9	−6.8	−4.4	−3.5	0.5	3.4	7.2
					−53.9	−61.2	−51.6	−42.5	−23.8	−9.9	37.3	93.2	100.8	53.2	−7.1	−34.5

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
81. INDIAN OCEAN: Bay of Bengal, East, Summary																
				k = .16	−51.3	−53.6	−44.3	−28.9	−5.2	19.2	44.6	69.2	63.1	29.6	−10.1	−32.7
				c	6.7	5.0	3.2	−1.5	−2.5	−6.9	−6.8	−4.4	−3.5	0.5	3.4	7.2
				±2.81	−44.6	−48.6	−41.1	−30.4	−7.7	12.3	37.8	64.8	59.6	30.1	−6.7	−25.5
82. INDIAN OCEAN: Bay of Bengal, West																
Dublat (In)	21°38N	88°08E	1937–43(1)	7	−19.0	−28.2	−28.2	−19.0	5.4	17.5	17.5	20.6	20.6	14.5	5.4	−6.8
Vizagapatam (In)	17°41N	83°17E	1937–46(1)	10	−8.1	−20.3	−23.3	−14.2	−2.0	4.1	1.0	1.0	7.1	22.4	22.4	10.2
				k = .24	−13.6	−24.3	−25.8	−16.6	1.7	10.8	9.3	10.8	13.9	18.5	13.9	1.7
				P_g	14.9	13.5	11.8	6.1	5.4	1.4	1.7	2.4	5.1	9.1	13.2	15.2
				c	7.1	5.7	3.6	−2.1	−2.8	−7.5	−7.7	−6.3	−3.7	0.9	5.2	7.9
				±4.50	−6.5	−18.6	−22.2	−18.7	−1.1	3.3	1.6	4.5	10.2	19.4	19.1	9.6
83. INDIAN OCEAN: Arabian Sea																
Bombay (In)	18°55N	72°50E	1878–1946	69	3.4	−0.1	1.4	1.5	−3.0	4.0	−1.7	−1.0	−6.4	−4.7	1.2	5.4
Karāchi (In)	24°48N	66°58E	1937–46	10	−2.3	−3.5	−1.3	1.7	4.1	8.4	1.7	1.1	−4.4	−5.3	−0.4	−0.1
				k = .12	1.8	−1.0	0.7	1.6	−1.1	5.2	−0.8	−0.4	−5.9	−4.9	0.8	3.9
				P_g	15.9	14.5	11.5	8.5	5.7	1.4	0.0	2.4	5.1	11.5	13.9	15.6
				c	7.6	6.2	2.8	−0.2	−3.0	−8.0	−10.0	−6.8	−4.2	2.8	5.4	7.8
				±1.20	9.4	5.2	3.5	1.4	−4.1	−2.8	−10.8	−7.2	−10.1	−2.1	6.2	11.7
84. INDIAN OCEAN: Iran, Persian Gulf																
Fao (Ir)	29°58N	48°30E	1945	1	−9.1	−17.4	−12.4	0.8	9.8	16.0	17.1	8.8	3.1	−6.0	−3.8	−6.9
Basrah (Ir)	30°31N	47°51E	1917–18	2	−31.4	−7.9	7.3	34.2	54.4	41.0	20.1	−5.4	−22.8	−30.0	−30.7	−28.5
				k = .58	−20.3	−12.7	−2.6	17.5	32.1	28.5	18.6	1.7	−9.9	−18.0	−17.3	−17.7
				P_g	20.0	18.3	15.2	11.5	8.8	4.0	1.4	2.4	7.4	13.2	17.6	18.3
				c	9.0	7.3	3.8	0.1	−2.6	−8.1	−11.2	−9.5	−4.6	1.8	6.4	7.8
				±8.75	−11.3	−5.4	1.2	17.6	29.5	20.4	7.4	−7.8	−14.5	−16.2	−10.9	−9.9

85. INDIAN OCEAN: Suez Canal

Généffé (Su)	30°10N	32°34E	1937–41	5	5.7	4.6	−3.0	4.1	−1.1	−6.0	−2.3	−3.0	−7.0	−1.2	7.0	2.7
Kabret (Su)	30°16N	32°30E	1923–27, 1932–41	15	4.3	2.0	−0.7	−0.5	−0.8	−5.5	−2.3	−2.8	−6.7	−2.2	7.8	7.0
Déversoir (Su)	30°25N	32°21E	1937–41	5	5.0	4.5	−3.5	3.0	−1.2	−6.3	−1.3	−1.9	−5.6	−1.3	5.8	3.3
				k = .21	4.8	3.3	−2.0	1.5	−1.0	−5.8	−2.0	−2.6	−6.5	−1.7	7.1	5.0
				P_g	17.6	15.9	12.5	11.5	10.8	8.5	7.4	6.8	10.8	11.8	14.9	15.9
				c	6.1	4.4	0.6	−0.4	−1.1	−4.1	−5.7	−5.6	−1.7	−0.1	3.2	4.9
				±.62	10.9	7.7	−1.4	1.1	−2.1	−9.9	−7.7	−8.2	−8.2	−1.8	10.3	9.9

86. INDIAN OCEAN: Gulf of Suez

Port Thewfik (Su)	29°57N	32°34E	1923–29, 1931–46	23	11.2	7.9	4.1	4.6	3.7	−7.3	−11.4	−13.3	−17.7	−5.9	11.1	12.4
				k = .21												
				P_g	17.6	15.9	12.5	11.5	10.8	8.5	7.4	6.8	10.8	11.8	14.9	15.9
				c	6.1	4.4	0.6	−0.4	−1.1	−4.1	−5.7	−5.6	−1.7	−0.1	3.2	4.9
					17.3	12.3	4.7	4.2	2.6	−11.4	−17.1	−18.9	−19.4	−6.0	14.3	17.3

87. INDIAN OCEAN: Arabia, Red Sea

Aden (Ar)	12°47N	44°59E	1879–93(1), 1937–46(4)	25	5.3	6.8	7.4	9.5	10.4	4.4	−5.9	−13.8	−12.5	−9.6	−3.3	1.4
				k = .20												
				P_g	14.9	12.8	11.2	9.8	8.1	4.7	4.0	4.7	7.1	9.8	12.5	14.5
				c	5.9	3.8	1.8	0.4	−1.3	−5.4	−6.6	−5.2	−2.9	0.4	3.3	6.0
					11.2	10.6	9.2	9.9	9.1	−1.0	−12.5	−19.0	−15.4	−9.2	0.0	7.4

88. INDIAN OCEAN: Kenya, Tanganyika

Kilindini (Ke)	4°04S	39°39E	Oct. 1932–Sept. 1933(2)	1	1.6	0.5	4.1	5.0	1.7	−1.8	−0.6	−2.5	−4.0	−2.1	1.1	−3.2
Dar-es-Salaam (Ta)	6°49S	39°19E	Apr. 1929–Mar. 1930(2)	1	0.8	2.7	0.9	4.8	−1.3	−0.9	−4.2	−6.5	−2.3	2.4	−0.9	4.7
				k = .70	1.2	1.6	2.5	4.9	0.2	−1.4	−2.4	−4.5	−3.2	0.2	0.1	0.8
				P_g	9.8	9.8	10.1	11.5	11.8	14.2	14.2	14.2	14.2	12.5	11.8	10.1
				c	−1.7	−1.7	−1.8	−0.4	−0.1	1.6	1.1	1.8	1.7	0.6	0.1	−0.9
				±1.22	−0.5	−0.1	0.7	4.5	0.1	0.2	−1.3	−2.7	−1.5	0.8	0.2	−0.1

89. INDIAN OCEAN: Union of South Africa

Durban (SA)	29°52S	31°03E	Oct. 1926–Sept. 1927 (2)	1	5.7	0.5	8.9	3.8	1.3	−7.0	−14.9	−0.8	−8.9	1.8	1.4	8.2
				k = 1.00												
				P_g	12.5	12.5	14.2	16.9	17.6	21.6	22.0	21.3	19.3	15.9	14.5	12.5
				c	−3.7	−3.7	−2.4	0.3	1.0	4.3	4.2	4.2	2.1	−0.7	−1.9	−3.2
					2.0	−3.2	6.5	3.5	2.3	−2.7	−10.7	3.4	−6.8	1.1	−0.5	5.0

Station	Latitude	Longitude	Years	Total Years	J	F	M	A	M	J	J	A	S	O	N	D
90. ANTARCTIC OCEAN: Palmer Peninsula																
Marguerite Bay[15,17]	68°11S	67°00W	Apr. 1947–Feb. 1948	1	−3.5	3.2		11.1	2.1	−6.3	−0.8	−3.2	−0.2	−1.1	1.9	−2.9
Port Circoncision[16,17]	65°10S	64°14W	Feb.–Aug., Oct., Nov. 1909	1		−2.3	4.2	5.8	7.2	7.2	−1.0	3.4		−6.1	−8.5	
					−3.5	−0.7	4.2	6.8	5.7	−0.4	−0.9	−2.4	−0.2	−3.1	−2.0	−2.9
91. ANTARCTIC OCEAN: Adélie Land																
Port Martin[18]	66°49S	141°24E	Aug., Sept. 1950, Feb., May–Oct., 1951			7.2			−0.8	−11.8	3.2	−5.8	4.2	3.7		
Cape Denison[19]	67°00S	142°40E	June–Aug., 1912							−8.1	−1.4	−4.8				
						7.2			−0.8	−10.0	0.9	−5.6	4.2	3.7		
92. ANTARCTIC OCEAN: Macquarie Island																
Macquarie Island[19,20]	50°31S	158°58E	Aug. 1912–May 1913		−6.0	−12.1	−1.7	5.0	−4.5			−0.5	8.6	4.7	−2.3	9.2

FOOTNOTES

[1] Values taken as positive downward though given as positive upward. Confirmed by letter from J. A. Barahona Fernandes. The error seems to have arisen out of a confusion between "dessous" and "dessus"!

[2] Unpublished data furnished by Liverpool Observatory and Tidal Institute.

[3] (a) Thomson tide gauge, (b) Mier tide gauge.

[4] Changed October value from 7.778 to 6.778.

[5] Unpublished data from U. S. Coast and Geodetic Survey.

[6] Changed March value from 1.93 to 2.93.

[7] Combined La Coloma, 22°14N 83°34W, and Los Arroyos, 22°21N 84°23W.

[8] Report of the International Polar Expedition to Point Barrow, Alaska, by Lt. P. H. Ray, Washington, 1885.

[9] Omitted data for March, 1951.

[10] Three years data for August and September only; two years data for remaining months.

[11] July, August, September, 1948, February through August, 1949, February through April, 1950.

[12] Values taken as positive downward, though given as positive upward.

[13] Tidal Record 1930–49, Geophysical Survey Institute, Ministry of Construction, Japan, 1950.

[14] Values taken as positive upward, though given as positive downward.

[15] Tidal Work on Marguerite Bay, Antarctica, Ronne Antarctic Research Expedition, Office of Naval Research, 1948.
For following months data were available only for stated number of days: Feb., 17 days; Apr., 7 days; May, 13 days. Data complete for all other months.

[16] Deuxieme Expédition Antarctique Française (1908–1910, commandée par le Dr. Jean Charcot, Étude sur les Marées, by R.-E. Godfroy, Masson et C^{ie}, Paris.
For following months data were available only for stated number of days: Feb., 26 days; Aug., 6 days; Oct., 11 days. Data complete for all other months.

[17] In combining these two stations the values for the months where the data are incomplete have been multiplied by a factor proportional to the respective number of days for each station. Where the incomplete data represent a period of consecutive days at the beginning or end of a month, the months have been divided into two periods, which have been averaged separately and later combined.

[18] Nouveaux Enregistrements de Marée en Terre Adélie, by Bertrand Imbert, Extrait du Bulletin d'Information du Comité Central d'Océanographie et d'Étude des Côtes, V, 7, 1953.

[19] Australasian Antarctic Expedition, 1911–1914, Scientific Reports, Series A, Vol. II Oceanography, Part 2 Tidal Observations by A. T. Doodson, Dec. 1939.
Data available for stated number of days: June, 20 days; July, 22 days; Aug., 31 days.

[20] Analysed in separate months of 29 days each.

[21] Values may reflect other than oceanic conditions; station located upriver or at estuary head.

APPENDIX II

No.	Locality	Latitude	Longitude	BTs/Mo.	NB	Reference		J	F	M	A	M	J	J	A	S	O	N	D
	ATLANTIC OCEAN (ARCTIC SECTOR)																		
1.	Barents Sea	70°–76°N	033°–040°E	0	62	Conseil (1904)	z_T		1.1			−1.3			−1.6			1.7	
							z_S		0.4			0.5			0.0			−0.7	
							z_α		1.2			−0.5			−1.5			0.8	
	ATLANTIC OCEAN																		
2.	Norwegian Sea	65°–71°N	006°W–006°E	0	163	HYDRO	z_T		−6.8			−0.6	−0.4	1.8	3.2	2.7			
							z_S		2.0			0.3	−0.5	−0.3	−0.2	−1.4			
							z_α		−4.3			−0.4	−1.1	1.4	3.2	1.4			
3.	North Sea	55°–60°N	005°–010°E	57[1]	unk.	Dietrich (1950)	z_T	−1.0	−4.0	−4.5	−3.9	−2.7	−0.9	1.4	2.8	3.9	4.7	3.0	1.2
							z_S	0.0	−1.0	−1.3	−0.9	−0.7	−0.4	0.0	0.7	0.9	1.1	1.0	0.5
							z_α	−0.6	−2.7	−3.7	−3.7	−2.9	−1.3	0.6	2.7	4.3	3.4	2.5	1.2
4.	Bay of Biscay	40°–51°N	005°–022°W	0	unk.	Helland-Hansen (1930)	z_T	−4.7	−4.7	−4.6	−4.5	−2.0	1.1	4.3	6.1	5.6	4.5	2.6	−3.5
5.	Station "K"	45°N	016°W	0	19	COEC (1951)	z_T	−2.5	−3.0	−3.0	2.0	2.0	1.2	1.3	1.6	1.6	2.0	−0.6	−2.0
							z_S	0.8	0.3	−0.2	−2.2	−1.5	−0.5	0.2	0.5	0.6	0.8	0.5	0.5
							z_α	−1.7	−2.4	−3.2	−0.2	0.5	0.6	1.5	2.1	2.2	2.8	−0.2	−1.6
6.	Off Gibraltar	32°–37°N	010°–015°W	104[1]	—[2]	WHOI	z_T	0.3	−2.4	−3.5	−3.7	−2.6	−0.9	0.7	2.1	2.6	2.3	3.3	1.8
7.	Mediterranean	35°–40°N	015°–020°E	163[1]	—[2]	WHOI	z_T	−3.0	−4.6	−5.3	−5.4	−2.0	−0.2	3.2	3.4	2.3	5.2	5.8	0.4
8.	South of the Azores	32°–37°N	026°–031°W	87[1]	1	WHOI	z_T	1.9	−0.2	−3.2	−4.1	−4.7	−4.8	−2.8	−0.3	3.1	5.2	5.3	4.6
9.	Capetown	33°–36°S	012°–018°E	0	30	DISCOVERY (1944)	z_T	−3.1	−3.8	4.0	10.0	8.3	2.6	−15.1	−21.5	−10.6	6.8	13.0	9.3
							z_S	−1.7	3.6	0.6	−1.9	−2.5	−1.1	6.6	9.5	3.4	−4.8	−7.1	−5.9
							z_α	−5.0	−0.8	4.9	8.3	6.0	0.8	−8.3	−11.3	−7.1	2.3	6.6	3.6
10.	40,000 South	38°–42°S	001°W–003°E	0	15	DISCOVERY (1944)	z_T	1.5	2.2	2.9	2.2	0.3	−0.1	−0.1	−1.3	−2.6	−3.1	−1.9	0.0
							z_S	1.2	0.1	−1.4	−1.5	−0.1	0.5	0.2	−0.3	−0.8	−0.1	0.9	1.2
							z_α	2.7	2.4	1.6	0.8	0.2	0.3	0.1	−1.6	−3.3	−3.1	−1.1	1.1
11.	Falkland Is.	52°S	052°W	0	unk.	Deacon (1933)	z_T	1.8	3.2	4.5	4.6	3.9	1.1	−1.8	−4.2	−5.0	−4.6	−2.8	−0.4
							z_S	−0.7	0.2	0.7	1.2	1.5	1.1	0.5	0.0	−0.4	−1.1	−1.5	−1.3
							z_α	0.9	3.7	5.4	6.4	5.5	2.0	−1.3	−4.4	−5.9	−6.0	−4.6	−1.8
12.	Recife	04°–09°S	030°–035°W	12[1]	2	WHOI	z_T	1.1	2.2	3.3	2.8	0.1	−2.0	−2.4	−2.0	−1.6	−1.0	−0.6	0.0
13.	Puerto Rico	15°–20°N	063°–068°W	91[1]	3	WHOI	z_T	−2.5	−4.8	−4.5	−2.2	−0.1	0.7	1.1	2.0	3.4	4.1	2.6	0.2
14.	Gulf of Mexico	22°–27°N	082°–087°W	166[1]	4	WHOI	z_T	1.6	−2.7	−5.3	−4.7	−2.1	−0.2	1.0	1.9	2.2	2.3	3.2	2.9
15.	Florida C.	33°–35°N	070°–075°W	76[1]	1	WHOI	z_T	−5.3	−6.5	−8.8	−9.3	−5.0	0.4	4.5	8.4	10.0	8.5	3.5	0.6
16.	Bermuda	31°–34°N	062°–068°W	99[1]	132	Fuglister (1947)	z_T	−2.3	−4.9	−6.6	−6.9	−5.6	−3.8	0.3	4.5	7.6	8.9	6.7	2.2
							z_S	−0.1	−0.1	0.0	0.0	0.3	0.5	0.5	0.1	−0.3	−0.6	−0.4	0.0
							z_α	−2.6	−5.0	−6.4	−6.8	−5.3	−3.4	0.7	4.7	7.3	8.5	6.4	1.9

17. East Sargasso	30°–35°N	045°–050°W	101[1]	—[2]	WHOI	z_T	−0.8	−2.2	−3.9	−4.4	−2.7	−1.3	0.9	2.4	2.6	3.7	3.5	2.2
18. North of Bermuda	34°–37°N	062°–068°W	70[1]	73	Fuglister (1947)	z_T	−7.3	−10.6	−11.4	−10.2	−7.0	−2.0	5.0	10.9	14.0	12.0	6.4	0.3
						z_S	0.1	0.0	−0.2	−0.2	−0.1	−0.2	0.0	0.4	0.4	0.1	0.1	0.0
						z_α	−6.6	−10.1	−11.5	−10.6	−8.4	−2.3	5.2	11.6	14.8	12.2	6.5	−0.8
19. Gulf Stream	35°–37°N	070°–075°W	875[1]	—[2]	WHOI	z_T	−3.7	−5.4	−6.8	−5.5	−2.6	0.9	3.5	4.7	5.7	6.0	4.0	−0.7
20. Nova Scotia	40°–45°N	060°–065°W	506[1]	—[2]	WHOI	z_T	−0.9	−5.2	−9.7	−8.6	−5.5	−1.2	1.8	3.5	6.0	7.0	7.2	5.2
21. Newfoundland	47°–52°N	043°–048°W	146[1]	2	WHOI	z_T	−1.4	−2.7	−5.0	−4.1	−3.7	−1.8	1.0	2.8	3.8	3.7	3.1	3.2
22. Irminger Sea	60°–65°N	030°–035°W	267[1]	1	WHOI	z_T	−1.3	−2.5	−3.4	−3.3	−1.7	0.8	2.0	2.8	3.1	2.9	1.3	−0.7
						ARCTIC OCEAN												
23. Point Barrow	72°–73°N	156°–159°W	17	1	Worthington (1953)	z_T				−0.4					0.4			
						PACIFIC OCEAN												
24. Aleutian Is.	52°–53°N	179°E–180°	8	1	Pattullo (1950)	z_T	−0.4	−1.1	−1.4	−1.3	−0.8	−0.6	−0.6	0.5	1.7	1.4	1.6	0.8
25. Kodiak I.	56°30′N	152°30′W	unknown	1	Robinson (in press)	z_T	−0.8	−2.7	−3.2	−2.3	−1.7	−1.2	0.1	2.1	3.6	3.2	2.0	0.5
26. Gulf of Alaska	55°–60°N	145°–150°W	17	1	Robinson (in press)	z_T	0.8	−0.5	−1.5	−2.0	−1.9	−0.8	0.1	0.5	0.8	1.4	1.6	1.4
27. Vancouver I.	47°30′N	127°30′W	unknown	2	Robinson (in press)	z_T	−1.5	−2.5	−3.0	−2.9	−1.8	−0.2	1.6	3.1	3.8	2.4	1.1	−0.3
28. California C.[3]	36°–37°N	121°–122°W	0	1100	Skogsberg (1936)	z_T	1.2	−0.5	−1.3	−2.4	−3.6	−3.6	−1.8	−0.1	2.0	3.0	3.4	3.8
	32°–33°N	117°–118°W	12	5	SIO													
29. Ecuador	01°-06°S	080°–090°W	0	38	DISCOVERY (1949)	z_T		−0.2					0.6	1.8			−2.3	
						z_S		2.2					−1.8	−1.5			1.1	
						z_α		2.1					−1.1	0.2			−1.2	
30. Peru C.	09°–17°S	075°–085°W	0	38	DISCOVERY (1949)	z_T	−0.3	6.9				−3.7	−0.1	−2.7				
						z_S	1.4	−1.4				0.8	−0.6	−0.4				
						z_α	1.1	5.9				−2.9	−0.9	−3.1				
31. Station "Nan"	29°–31°N	139°–141°W	95	1	Robinson (1951)	z_T	−1.6	−2.4	−3.2	−3.3	−2.7	−1.5	0.8	2.8	3.6	3.0	3.8	0.4
32. Station "Papa"	48°–50°N	147°–149°W	56	2	LaFond	z_T	0.6	−0.4	−1.8	−2.5	−1.8	−1.0	0.9	1.8	2.1	1.8	0.8	0.8
33. Stn. 40150	40°30′N	150°30′W	unknown	1	Robinson (in press)	z_T	−3.0	−4.7	−5.4	−4.2	−2.6	−0.7	2.6	5.6	7.4	5.8	0.7	−1.7
34. Stn. 38158	37°–39°N	157°–159°W	21	3	Robinson (in press)	z_T	−0.8	−3.3	−3.8	−2.7	−1.2	1.3	2.6	2.5	1.9	1.9	1.3	0.9
35. Hawaii	20°–25°N	157°–160°W	56	6	Leipper (1950)	z_T	−1.6	−2.1	−2.3	−2.6	−2.0	−0.6	1.1	2.7	4.0	3.2	1.3	−0.7
36. Stn. "Quebec"	42°–44°N	166°–168°W	19	1	SIO	z_T	−4.1	−3.6	−0.8	1.8	0.9	−0.5	−0.6	1.5	3.5	2.3	0.3	−0.7
37. Stn. "Queen"	41°–43°N	172°–174°W	59	1	SIO	z_T	−2.5	−3.2	−3.2	−2.0	0.1	0.4	1.0	3.7	4.7	2.4	0.1	−1.3
38. Stn. "Victor I"	33°–35°N	172°–174°E	28	2	SIO	z_T	−2.0	−3.8	−3.5	−2.2	−0.7	1.7	2.6	2.2	2.9	2.7	1.4	−0.6
39. Stn. "Victor II"	30°–32°N	163°–165°E	48	2	SIO	z_T	−3.0	−4.7	−5.8	−6.9	−7.1	−3.6	2.3	4.4	5.7	7.9	7.4	2.9
40. Marshalls—15°N	14°-16°N	155°–175°E	unknown		Mao (1953)	z_T	Apr. through Sept.			8.4	Oct. through Mar.			−8.4				
						z_S	Apr. through Sept.			0.3	Oct. through Mar.			−0.3				
						z_α	Apr. through Sept.			8.8	Oct. through Mar.			−8.8				
41. Eniwetok	10°–12°N	161°–163°E	9	2	Robinson (1952)	z_T	0.0	−1.4	−3.4	−5.2	−4.0	−0.4	3.2	4.5	3.6	1.7	1.3	0.0

No. Locality	Latitude	Longitude	BTs/Mo.	NB	Reference		J	F	M	A	M	J	J	A	S	O	N	D
42. Marshalls—3°N	02°–04°N	155°–175°E	unknown		Mao (1953)	z_T	Apr. through Sept.			−3.0	Oct. through Mar.			3.0				
						z_S	Apr. through Sept.			2.8	Oct. through Mar.			−2.8				
						z_α	Apr. through Sept.			−0.4	Oct. through Mar.			0.4				
43. Samoa	15°–19°S	170°–174°W	8	1	SIO	z_T	−1.4	0.4	1.3	1.4	1.2	1.5	0.7	−0.4	−0.8	−0.5	−1.0	−2.5
44. New Caledonia	20°–25°S	160°–165°E	25	3	SIO	z_T	6.3	5.7	5.8	6.2	2.1	−5.7	−10.2	−5.1	−3.8	−2.5	−0.4	1.7
45. Tasmania	42°–43°S	148°–149°E	0	13	CSIRO	z_T	−4.4	1.8	5.8	8.0	8.8	7.9	4.9	−0.5	−7.4	−10.8	−7.4	−5.6
						z_S	5.3	5.3	0.3	−3.4	−4.2	−5.7	−4.8	−3.4	−0.3	3.1	3.1	3.8
						z_α	0.9	7.0	5.0	4.2	4.0	3.3	0.0	−3.9	−7.6	−7.6	−4.3	−2.0
46. Sydney	34°–35°S	151°–152°E	0	64	CSIRO	z_T	−17.8	−13.4	−3.9	6.7	10.1	9.5	7.8	11.4	12.8	3.5	11.3	−17.3
						z_S	8.9	9.7	8.4	4.1	−0.9	−5.5	−7.8	−8.8	−8.2	−5.6	0.0	5.6
						z_α	−8.2	−3.0	3.9	10.4	9.1	4.1	0.3	3.1	5.1	−2.2	−11.3	−11.2
47. Truk	05°–10°N	150°–155°E	0	58	JAP-HYDRO	z_T	−4.3	6.3	8.1	3.2	8.1	5.1	2.6	1.2	−6.8	−9.2	−9.4	−6.4
						z_S	−0.2	−0.2	0.3	0.3	0.1	−0.2	0.0	0.6	0.5	−0.2	−0.6	−0.3
						z_α	−3.3	6.4	7.6	4.0	8.6	5.2	2.9	1.5	−6.4	−9.3	−10.0	−6.8
48. Sulu Sea	07°–12°N	117°–123°E	13	7	Leipper (1947)	z_T	−2.1	−2.9	−3.0	−2.4	−1.9	0.5	0.5	0.9	3.6	5.0	2.6	0.0
49. Mindanao Deep	09°–10°N	126°–128°E	unknown	3	Leipper (1947)	z_T	−4.6	−2.8	−2.0	−2.3	1.7	3.1	1.1	0.6	1.0	0.9	2.7	−0.1
50. Manila	14°–16°N	118°–120°E	7	5	Leipper (1947)	z_T	−1.8	−3.1	−3.9	−5.3	−4.1	0.9	4.3	3.4	2.6	3.5	3.0	0.5
51. Marianas	18°–20°N	145°–150°E	0	36	JAP-HYDRO	z_T	−7.1	−3.4	−2.6	0.9	−0.3	3.0	4.9	4.2	5.1	1.4	−1.7	−6.0
						z_S	−1.2	−1.9	−1.2	−1.2	−0.7	0.3	1.4	1.6	0.2	1.3	0.7	0.7
						z_α	−7.3	−5.5	−4.1	−0.4	−1.3	3.1	6.1	6.8	5.2	3.9	−1.2	−5.9
52. Formosa	23°–24°N	122°–123°E	0	198	JAP-HYDRO	z_T	−6.2	−4.7	0.9	3.3	2.8	1.2	1.1	4.0	4.7	1.3	−3.7	−6.1
						z_S	1.3	0.3	−3.3	−3.8	−2.4	−0.8	1.6	2.7	2.2	1.3	−0.7	1.9
						z_α	−4.3	−3.8	−2.1	−0.2	0.3	0.3	2.4	6.1	6.3	2.4	−3.8	−3.7
53. Okinawa	26°–27°N	126°–127°E	0	171	JAP-HYDRO	z_T	−1.8	−1.3	−4.3	−5.2	−2.1	3.5	8.9	3.6	2.4	−0.2	−0.8	0.0
						z_S	−4.6	−5.8	−2.0	−1.3	−0.7	0.4	1.0	3.0	4.2	4.8	3.7	−1.9
						z_α	−6.3	−7.1	−6.3	−6.4	−3.0	2.6	9.9	6.6	6.6	4.5	1.3	−1.9
54. Stn. "Tango"	29°–30°N	135°–136°E	0	80	JAP-HYDRO	z_T	−4.1	−7.0	−8.1	−8.4	−6.5	−1.6	3.2	6.7	9.1	10.9	5.8	−0.8
						z_S	−0.7	−0.8	−0.6	−0.1	0.5	0.9	0.9	1.0	0.5	0.0	−0.5	−0.9
						z_α	−5.1	−8.5	−9.6	−9.4	−6.9	−2.5	4.6	8.8	11.1	12.5	6.2	−1.7
55. Kuroshio[3]	unknown		0	unk.	Koenuma (1939)	z_T	−4.4	−5.5	−6.2	−6.4	−6.2	−3.2	−0.4	4.4	8.7	9.8	6.7	1.8
	34°–35°N	139°–140°E	0	118	Japanese	z_S	0.6	−0.7	−0.7	1.4	1.8	−1.5	−4.0	−2.9	1.2	2.4	1.9	1.4
	37°–38°N	142°–143°E	0	216	JAP-HYDRO	z_α	−4.4	−6.6	−7.2	−5.2	−4.6	−4.8	−3.7	2.3	10.8	12.6	8.6	2.5
56. Korea	39°–40°N	129°–130°E	0	117	Japanese	z_T	−3.7	−4.8	−5.1	−3.6	−1.0	0.1	1.9	3.4	3.6	4.4	3.8	1.0
						z_S	0.3	−0.4	−0.5	−1.3	−1.7	−0.4	−0.3	0.5	1.4	0.7	1.1	0.6
						z_α	−3.4	−5.0	−5.1	−5.0	−3.3	−0.9	1.4	4.2	5.2	5.5	5.0	1.3
57. Central Sea of Japan	38°–39°N	135°–136°E	0	84	Japanese	z_T	−6.8	−12.5	−10.7	−6.6	−5.0	−4.6	−1.7	7.0	13.0	13.8	9.3	4.7
						z_S	0.4	−0.3	−0.7	−0.8	−0.9	−1.0	−0.7	−0.1	0.4	0.9	1.2	1.3
						z_α	−6.9	−11.2	−10.8	−7.4	−6.4	−6.2	−3.3	6.1	13.7	15.4	11.0	5.9

58. Oyashio C.	41°–43°N	144°–146°E	0	141	JAP-HYDRO	s_T	2.8	−6.6	−9.2	−9.4	−7.3	−3.7	0.3	6.3	8.4	6.4	7.6	4.4
						s_S	5.2	4.2	3.8	6.7	2.8	2.4	−4.0	−7.3	−11.8	−7.3	0.4	6.3
						s_{ST}	7.2	−2.5	−5.1	−2.3	−4.9	−1.7	−4.2	−1.1	−2.8	−0.9	8.1	10.2
59. Stn. "Sugar"	43°–45°N	164°–166°E	24	2	SIO	s_T	−2.8	−3.5	−3.8	−3.5	−2.2	0.0	2.2	3.8	3.2	3.0	2.7	0.2
60. Station "Sierra"	47°–49°N	161°–163°E	38	1	SIO	s_T	−1.2	−2.2	−2.4	−2.9	−2.4	−0.5	0.5	2.3	3.8	3.6	1.6	−0.2
						INDIAN OCEAN												
91. Perth	32°–33°S	113°–114°E	0	14	CSIRO	s_T	−6.1	8.5	11.1	9.7	10.7	14.4	11.7	1.6	−7.2	−13.3	−19.5	−20.3
						s_S	6.8	7.7	−1.6	−1.9	−1.7	−1.6	−1.0	−0.4	−0.6	−3.7	−3.3	1.8
						s_{ST}	0.0	14.6	9.4	7.7	8.9	12.4	10.7	0.8	−8.3	−16.7	−22.0	−17.9
62. Sumatra	04°–09°N	090°–095°E	10	1	SIO	s_T	−0.6	−2.2	0.8	4.0	5.1	2.9	3.5	1.6	−5.3	−7.5	−4.7	2.0
63. Bay of Bengal	17°–18°N	083°–084°E	unknown		LaFond (1954)	s_T				−6.8						6.8		
						s_S				−20.6						20.6		
						s_{ST}				−27.4						27.4		
64. Central Arabian Sea	14°–19°N	064°–069°E	9	3	SIO	s_T	−7.8	−8.7	−6.1	−2.6	1.1	3.9	4.8	4.6	3.8	4.4	4.6	−2.0
65. Oman	18°–23°N	059°–064°E	24	2	SIO	s_T	0.9	2.6	1.8	−1.5	−1.6	7.7	2.1	−4.7	−8.6	−4.5	2.8	2.8
						ANTARCTIC OCEAN												
66. Davis Sea	65°–67°S	085°–089°E	0	19	von Drygalski (1926)	s_T	−0.2	−3.8	0.0			0.8			1.3		1.3	
						s_S	−1.3	2.1	1.9			−1.1			−0.1		−1.5	
						s_{ST}	−1.2	1.9	1.8			−1.1			0.0		−1.4	
67. Bouvet I.	52°–57°S	003°W–004E	0	36	DISCOVERY (1944)	s_T	−0.5	0.2	−0.3	1.7	−0.4	−0.5	−0.4	0.1	0.1	0.6		−0.6
						s_S	−0.9	0.6	0.4	1.9	−1.0	0.0	1.8	−0.1	0.0	−2.0		−0.2
						s_{ST}	−1.9	0.4	−0.2	3.5	1.8	−0.9	1.0	−0.4	−0.2	−1.9		−1.1
68. South Georgia I.	52°–53°S	037°–038°W	0	unk.	Deacon (1933)	s_T	0.8	1.2	1.0	0.6	−0.0	−0.5	−0.9	−1.0	−0.9	−0.6	−0.2	0.4
						s_S	0.1	0.7	0.7	0.2	−0.2	−0.3	−0.2	−0.1	−0.2	−0.2	−0.3	−0.3
						s_{ST}	0.5	1.0	0.9	0.4	−0.8	−0.3	−0.7	−0.6	−0.4	−0.5	0.0	0.0
69. South Shetland I.	58°–63°S	055°–065°W	0	79	DISCOVERY (1941)	s_T		−3.3	1.6	3.1							0.0	−1.4
						s_S		2.9	−1.7	7.2							−6.6	−1.6
						s_{ST}		−1.2	−0.5	8.8							−3.3	−3.9

FOOTNOTES

[T] Temperature data include both BT's and Nansen Bottle readings.

[S] Salinity found from scatter diagram of temperature and salinity observations and average TS relations given in *The Oceans*

[a] Data from the locations given were averaged together.