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**Drifter Studies in Warm Core Rings**

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**Technical Report**

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Abstract

The results of multiple deployments of surface drifters in warm core rings of the Gulf Stream are presented. Four satellite drifters (tracked by the Argos system) were deployed on nine separate occasions and two LORAN-C drifters (operated by the University of Miami) were deployed three times. Drifter studies were conducted during four cruises aboard the R/V Endeavor in 1982 in conjunction with the Warm Core Rings Experiment and one cruise of the USNS Bartlett in January 1983 which was sponsored by the Office of Naval Research. Translational velocities and periods of rotation are provided for two rings: 82B and 82H.

## Introduction

During 1982 four satellite tracked surface drifters and two LORAN-C drifters were deployed from the R/V Endeavor in conjunction with the Warm Core Rings (WCR) Experiment. This program, which included four multi-ship cruises in 1982, was designed to study the physical, chemical, and biological processes of evolving, developed and senescent warm core rings of the Gulf Stream. Surface drifters provided estimates of ring center positions for three warm core rings: 82B, 82H and 82I. Translational velocities and periods of rotation were also determined for rings 82B and 82H (Table 1). The dates of deployment and recovery of the drifters are summarized in Tables 2a and 2b.

Positions of the satellite tracked drifters were established via the Argos system, Centre Spatial de Toulouse, France. Updated fixes, obtained on shore, were transmitted to the ships via telemail. Tables 3 - 11 contain the unsmoothed fixes for the Argos satellite drifters. Although several drifters continued to provide data after exiting a warm core ring, the listings are restricted to the time frame of the cruises. Occasionally when the drifters were in close proximity to the research vessel, the drifters could be tracked on radar due to their deployment configuration (Figures 1a and 1b). LORAN-C drifters, equipped to record positions internally, telemetered LORAN positions to the ship when proximity and atmospheric conditions allowed.

Drifters were deployed within the rings as delineated by sea surface temperatures from satellite imagery and the depths of isotherms established by XBT surveys. The life histories of the buoys are discussed for the four 1982 WCR cruises aboard the R/V Endeavor and one cruise aboard the USNS Bartlett in 1983:

<u>Endeavor</u> 83	April 17 - May 8
<u>Endeavor</u> 86	June 10 - June 30
<u>Endeavor</u> 88	August 5 - August 25
<u>Endeavor</u> 90	September 22 - October 14
<u>Bartlett</u> 40-b	January 8 - January 24.

The satellite and LORAN-C buoys were constructed and deployed by the following investigators at the University of Miami: Robert Evans, Otis Brown, Kevin Leaman and Stan Hooker; and Marv Stalcup of the Woods Hole Oceanographic Institution. Figures 1a and 1b illustrate the typical configuration of the LORAN-C and Argos satellite drifters deployed during the Warm Core Rings studies.



### Endeavor 83

Two LORAN-C drifter deployments were made during the first cruise in 1983: (1) a deployment in the central region of ring 82B during the first CTD transect; (2) a deployment in conjunction with the study of the high velocity frontal region. The first drifter, deployed on April 22 (year day 112) at 1515 GMT, consisted of a Woods Hole Oceanographic Institution (WHOI) radar reflecting buoy tethered to a Rosenstiel School of Marine and Atmospheric Science (RSMAS) LORAN-C buoy; a sediment trap of the Lamont-Doherty Geological Observatory, suspended 100 m beneath the radar reflecting buoy, served as a drogue. LORAN positions, which were recorded within the LORAN-C buoy, were telemetered to the ship twice an hour. The second LORAN-C drifter deployment, in the high velocity region, occurred on 29 April, day 119, at 1232 GMT. The LORAN buoy was tethered to a radar transponding, plank-on-edge buoy equipped with a window shade drogue at 100 m.

To eliminate noise in the original data (Figure 2a), a cubic spline was fitted between points at 3 hour time intervals (Figure 2b). The noise may reflect changes in time delays due to varying meteorological conditions or shifts from ground waves to sky waves during the cruise. In Figure 2b the smoothed track of the drifter within the ring is annotated at the arrows with the year day corresponding to 0 GMT. The drifter track for the high velocity region is similarly annotated with arrows at three hour intervals. The track of the drifter within the ring reflects the westward movement and anticyclonic circulation of ring 82B. A translational speed of  $5.1 \text{ km day}^{-1}$  was determined from the positions on days 114 and 117 at 0 GMT. A rotational period of three days can be estimated for the ring. An azimuthal velocity of  $1 \text{ m sec}^{-1}$  is computed from the eastward drift of the buoy deployed in the high velocity region.

Six days after deployment on April 28, day 118, the LORAN transmission from the ring center drifter had ceased due to low battery voltage; the drifter was recovered at 1024 GMT. The drifter in the high velocity region was recovered on day 120 at 1230 GMT after a 24 hour drift.

### Endeavor 86

On June 14 at 1528 GMT during the first CTD survey of ring 82B, satellite drifter 02535 was deployed at CTD station 9, approximate ring center.

The trajectory of the buoy confirmed the anticyclonic rotation and southwest translation of ring 82B. The buoy drifted from the center of the ring toward the higher velocity region as evidenced by the increased size of the cycloid (Figure 3). Ring 82B continued to exhibit a three day period of rotation. Between days 166 and 178 the ring translated 76.5 km; this is equivalent to an average translational speed of  $6.4 \text{ km day}^{-1}$ , computed from the drifter positions at 0 GMT on days 166 and 178. A translational speed of  $5.7 \text{ km day}^{-1}$  is obtained using estimates of ring center. The drifter was recovered by the R/V Knorr on June 27 at 2200 GMT.

Although several LORAN-C drifter deployments were also made during Endeavor 86, they will not be presented here. The first drifter, number 7, was deployed on June 14 at 1425 GMT. The track for this drifter was erratic and of questionable reliability. The other drifter, number 9, failed to provide useful data due to leakage.

#### Endeavor 88

Two satellite tracked drifters, 02535 and 03482, and one LORAN-C drifter were deployed on August 14 at 2110, 2150 and 2218 GMT respectively. The cycloidal tracks of all drifters reflect the anticyclonic circulation and continued southwest translation of ring 82B (Figures 4a, 4b and 4c). The consistency in the transport of the three drifters is corroborated by their translations between year days 227 and 231: 96, 91 and 92 km. This corresponds to an average southwest translational velocity of approximately  $23 \text{ km day}^{-1}$ ; a value of  $18.5 \text{ km day}^{-1}$  is obtained using estimates of ring center. Ring 82B was therefore translating at a higher speed than during April and June. All drifters were recovered by the R/V Endeavor on August 19.

Buoy 02535 was redeployed in the estimated ring center at 1924 GMT on August 19. The drifter continued to drift anticyclonically between  $36.5^{\circ}\text{N}$  and  $37^{\circ}\text{N}$  for the next eighteen days. The ring had a three day period of rotation as evidenced by the three day cycle of the drifter (Figure 5). By September 7 (year day 250), the drifter had discontinued the anticyclonic rotation and was ejected from the ring. Although ring 82B persisted after this date (Robert Evans, personal communication), the drifter moved southward parallel to the coast. The drifter may have encountered the Gulf Stream on September 12 (year



day 256). Following a five day excursion to the northwest, drifter 02535 again turned to the south and on day 263 became entrained by the Gulf Stream. For the next two weeks (September 19 - October 4) the buoy was transported in the Gulf Stream at a rate of  $2 \text{ m sec}^{-1}$ . On September 27 (year day 270) the drifter began to delineate the formation of two large meanders (Figure 6). This event fortuitously coincided with the fourth of the 1982 warm core ring cruises.

#### Endeavor 90

The focus of the fourth of the warm core rings cruises in 1982 was to study ring formation. The deployment and consequent east-southeast movement of satellite drifter 03481 (Figure 7), however, reflects the position of the Gulf Stream between year days 267 and 273. As drifter 03481 was recovered, drifter 02535 was completing its travel in a meander south of  $39^\circ\text{N}$  and beginning to delineate a northern meander/evolving ring. The latter became the focus of study. As drifter 02535 completed its path in the second meander, year day 277, the R/V Endeavor conducted an XBT survey of the region. It is unclear from the drifter trajectory that the meander had closed and formed a distinct ring. The separation of ring 82H from the Gulf Stream appeared to occur between days 277 and 283 as the drifter made a tight cyclonic revolution, of approximately 21 km radius, and then proceeded to the southwest (Figure 6). The buoy appears to have been caught in an associated cyclonic eddy adjacent to the evolving ring. Although the drifter stopped transmitting on October 10, year day 283, the depth of the 15 degree isotherm and the currents measured at 28 m via the shipboard APOC (Acoustic Profiling of Ocean Currents) system, corroborate that a large portion of the meander was independent from the Gulf Stream; the eastern most sector may have maintained some contact.

On October 5, year day 267, three satellite drifters were deployed to study the genesis and life history of ring 82H (Figure 8). The tracks of drifters 03482 and 03481 illustrate the anticyclonic circulation of ring 82H; however, drifter 03480, which may be the best reflection of ring center, exhibited little cycloidal drift but was transported to the west-southwest (Figure 9). The translation of ring 82H from October 6-14, computed from the track of 03480, was 134 km; the average translational speed was

16.8 km day<sup>-1</sup>. A period of rotation of six days is estimated for the newly formed ring. Drifters 03481 and 03482 were not recovered; however, the R/V Knorr retrieved drifter 03480 on October 14 at 119 GMT.

Despite the proximity of the deployments of buoys 03481 and 03482 their paths eventually became quite different. By October 18, year day 291, ring 82H was interacting with a meander of the Gulf Stream. The interpretation of satellite imagery for October 18-19, provided by the National Weather Service (NWS)/National Earth Satellite Service and modified by the Atlantic Environmental Group (AEG), National Marine Fisheries Service (NMFS), shows ring 82H to be abutted to a Gulf Stream meander on the southwest and flanked by a streamer of shelf water to the east. Deformation of ring 82H was occurring during this time; the southward velocity of drifters 03481 and 03482 may reflect the Gulf Stream interaction, the currents associated with the streamer, or the outer high velocity region of the asymmetric ring (Figure 8). Ring 82H continued to persist and move to the southwest following the interaction with the Gulf Stream. Some surface signature of 82H appears in satellite imagery until February 7-8, 1983. The estimated position of the ring at that time was 39°N; 72°W.

Drifter 03481 continued its southward drift in association with a Gulf Stream meander; between year days 291 and 300 the drifter interacted with and passed through the Gulf Stream. The latter interpretation is based on two satellite images, October 18-19 and October 25-26, provided by NWS and modified by AEG. During this period, although the drifters were south of the Gulf Stream, their transport was parallel to the southern boundary of a closing meander. Neither drifter was incorporated in a cold core ring that was well defined by November 1, year day 303. Between days 309 and 324 (November 5 - November 24) drifter 03481, now south of the Gulf Stream, looped anticyclonically, possibly in an eddy associated with another meander/developing cold core ring. By November 23 (year day 327) the drifter was incorporated in this ring (Figure 10). The cyclonic rotation was evident until the last transmission from the buoy, January 31 at 2322 GMT. With the exception of two very large rotations with periods of 6-7 days, the circulation period of the cold core ring was 3-4 days (Figure 11).



Although all drifters were drogued at 100 m, it is possible that the trajectories of drifters 03481 and 03482 may reflect drift due to wind. Since ring 82H continued to persist after its interaction with the Gulf Stream, it is unlikely that the movement of drifter 03482 reflects a dynamic mechanism for exchange between warm and cold core rings.

Drifter 03482 had a limited life in ring 82H and appeared to interact with the Gulf Stream after two anticyclonic rotations in ring 82H (Figure 12). Based on satellite imagery this drifter also crossed the Gulf Stream and moved eastward. By November 2 when a cold core ring (65°W; 36.5°N) had evolved, drifters 03482 and 03481 were well south of the Gulf Stream. It is possible that the drifter interacted with cold core rings which formed later in 1982. The drifter continued its eastward transport over the next year; a lapse in transmission occurred in 1983 after November 27, day 331. The final transmission obtained for drifter 03482 occurred on December 23, day 357. The position of the drifter at that time was 36.53°N and 38.46°W.

#### Bartlett 40-b

On January 11, 1983 an Argos satellite drifter was deployed from the USNS Bartlett in conjunction with the study of winter cooling of a warm core ring. The drifter, launched at 0520 GMT in the estimated center of ring 82I, attained an azimuthal velocity of 40 cm sec<sup>-1</sup> as it was transported to the southwest during the next four days (Figure 13). The short period of transmission is insufficient for determinations of circulation period and translational velocity. The final transmission from the buoy occurred on January 14 at 0929 GMT.

#### Acknowledgements

Programs used to smooth and plot the drifter data were developed by Roger Goldsmith. The personnel aboard the R/V Endeavor were instrumental during drifter deployments and recoveries. The preparation of this report and the purchase and processing of the data was supported by the National Science Foundation, grant OCE80-16983; Terrence Joyce and Raymond Schmitt, principal investigators.



Figure Captions

- Figure 1a: LORAN-C drifter configuration used during the Warm Core Rings Experiment.
- Figure 1b: Satellite drifter configuration used during the Warm Core Rings Experiment.
- Figure 2a: Unsmoothed tracks of LORAN-C surface drifters deployed during cruise 83 of the R/V Endeavor. Deployments were made in the central and high velocity regions of warm core ring 82B on April 22 at 1515 GMT and April 29 at 1232 GMT respectively.
- Figure 2b: The LORAN-C drifter tracks from Figure 1a smoothed with a cubic spline interpolation over three hour time intervals. Arrows on the track of the ring center drifter mark the beginning of each year day; arrows on the track of the drifter deployed in the high velocity region mark three hour time intervals.
- Figure 3: Smoothed surface track of Argos satellite drifter 02535 deployed in the estimated center of ring 82B on June 14 (year day 165) at 1528 GMT during cruise 86 of the R/V Endeavor. Arrows mark the positions at 0 GMT.
- Figure 4a: Smoothed track of Argos satellite surface drifter 03482 deployed on August 14 (year day 226) at 2150 GMT in the estimated center of ring 82B during cruise 88 of the R/V Endeavor. Arrows mark the positions at 0 GMT.
- Figure 4b: Smoothed track of Argos satellite surface drifter 02535 deployed on August 14 (year day 226) at 2110 GMT in the estimated center of ring 82B during cruise 88 of the R/V Endeavor. Arrows mark the positions at 0 GMT.
- Figure 4c: Track of LORAN-C surface drifter deployed on August 14 (year day 226) at 2218 GMT in the estimated center of ring 82B during cruise 88 of the R/V Endeavor. The track was smoothed with a cubic spline interpolation over three hour time intervals.
- Figure 5: Partial track of satellite surface drifter 02535 deployed in the estimated center of ring 82B on August 19 (year day 231) at 1924 GMT during cruise 88 of the R/V Endeavor. Arrows mark the positions of the drifter at the beginning of each year day.
- Figure 6: Entire track of satellite surface drifter 2535 deployed during cruise 88 of the R/V Endeavor. Track reflects the position of the Gulf Stream and the meanders/developing rings. Arrows, annotated with year days, mark the drifter positions at the beginning of each day (0 GMT).

- Figure 7: Track of Argos surface drifter 03481 deployed on September 24 (year day 267) at 2015 during cruise 90 of the R/V Endeavor. The track reflects the position of the Gulf Stream.
- Figure 8: Tracks of three Argos surface drifters, 03480, 03481, and 03482, deployed in ring 82H during cruise 90 of the R/V Endeavor. Drifter 03480 is the best reflection of the ring center translation; drifters 03481 and 03482 reflect the anticyclonic rotation and westward movement of ring 82H. The Gulf Stream (GS), warm core ring (82H) and shelf water intrusion (ShW) positions on year day 291 have been added to delineate the dynamic interactions occurring as drifters 03481 and 03482 move southward.
- Figure 9: Track of Argos surface drifter 03480, deployed in the center of ring 82H on October 5 (year day 278) at 1525 GMT, during cruise 90 of the R/V Endeavor. Drifter 03480 provides the best estimate of ring center positions during this cruise.
- Figure 10: Tracks of Argos surface drifters 03481 and 03482 deployed in ring 82H on October 5 (year day 278) during cruise 90 of the R/V Endeavor. Arrows, some of which are annotated with the year day, mark the drifter position every three days at 0 GMT.
- Figure 11: Entire track of Argos surface drifter 03481 deployed in ring 82H on October 5 (year day 278) at 1127 GMT. Arrows mark the position of the drifter every three days. The incorporation of the drifter in a cold core ring on day 321 is evident.
- Figure 12: Track of Argos surface drifter 03481 in a cold core ring. Arrows mark the position of the drifter every 24 hours at 0 GMT; select arrows are annotated with the year day.
- Figure 13: Entire track of Argos surface drifter 03482 in 1982 and 1983. Deployment occurred on October 5 (year day 278) at 2015 GMT. Arrows mark the positions of the drifter every seven days at 0 GMT; select arrows are annotated with the year day.
- Figure 14: Track of Argos surface drifter 03480 deployed in ring 82I on 11 January 1983 at 0520 GMT from the USNS Bartlett.

Table Captions

- Table 1. Translational velocities and periods of rotation determined for two warm core rings from Argos and LORAN-C buoys.
- Table 2a. Satellite drifter deployments in the Warm Core Rings Experiment 1982.
- Table 2b. LORAN-C drifter deployments in the Warm Core Rings Experiment 1982.
- Table 3. Positions of Argos satellite drifter 02535 during cruise 86 of the R/V Endeavor.
- Table 4. Positions of Argos satellite drifter 03482 during cruise 88 of the R/V Endeavor.
- Table 5. Positions of Argos satellite drifter 02535 during cruise 88 of the R/V Endeavor.
- Table 6. Positions, from the second deployment, of Argos satellite drifter 02535 during and after cruise 88 of the R/V Endeavor.
- Table 7. Positions of Argos satellite drifter 03481 during cruise 90 of the R/V Endeavor.
- Table 8. Positions of Argos satellite drifter 03480 during cruise 90 of the R/V Endeavor.
- Table 9. Positions of Argos satellite drifter 03481 during cruise 90 of the R/V Endeavor.
- Table 10. Positions of Argos satellite drifter 03482 during cruise 90 of the R/V Endeavor.
- Table 11. Positions of Argos satellite drifter 03480 during cruise 40-b of the USNS Bartlett.
- Table 12. A Gregorian to year day calendar conversion.



Table 1.

Translational velocities and periods of rotation determined for two warm core rings from Argos and LORAN-C buoys

Ring	Cruise	Translational Velocity (km/day)	Year days for velocity calculation	Period of Rotation (days)
82B	<u>Endeavor</u> 83	west 5.1 (point to point)	114-117	3
	<u>Endeavor</u> 86	southwest 6.4 (point to point)	166-178	3
		5.7 (ring center estimate)		
82B	<u>Endeavor</u> 88	southwest 23.0 (point to point)	227-231	3
		18.5 (ring center estimate)		
82H	<u>Endeavor</u> 90	west-southwest 16.8 (point to point)	279-287	6

Table 2a.

Satellite drifter deployments in the Warm Core Rings Experiment 1982

Cruise	Platform	Deployment		Recovery	
		Year	day GMT	Year	day GMT
<u>Endeavor 86</u> Ring 82B	02535	165 June 14, 1982	1528	178 June 27, 1982 (R/V <u>Knorr</u> )	2200
<u>Endeavor 88</u> Ring 82B	02535	226 August 14, 1982	2110	231 August 19, 1982	1730
	03482	226 August 14, 1982	2150	231 August 19, 1982	1658
	02535	231 August 19, 1982	1924	283 October 10, 1982 not recovered; stopped transmitting during <u>Endeavor 90</u>	2251
<u>Endeavor 90</u>	03481	267 September 24, 1982	2015	273 September 30, 1982	0954
	03481	278 October 5, 1982	1127	not recovered; last transmission on 31 2322 January 31, 1983	
	03480	278 October 5, 1982	1545	287 October 14, 1982 (R/V <u>Knorr</u> )	1109
	03482	278 October 5, 1982	2015	not recovered; last transmission on 357 0719 December 23, 1983	
USNS <u>Bartlett</u>	03480	11 January 11, 1983	0520	not recovered; last transmission on 13 2216 January 13, 1983	



Table 2b.

LORAN-C Drifter Deployments in the Warm Core Rings Experiment 1982

Cruise	Drifter	Deployment		Recovery	
		Year Day	GMT	Year Day	GMT
<u>Endeavor 83</u> Ring 82B Ring center		112 April 22, 1982	1515	118 April 28, 1982	1024
	High velocity region	119 April 29, 1982	1232	120 April 30, 1982	1230
<u>Endeavor 86</u>	#7 Frodo	165 June 14, 1982	1425	173 June 22, 1982	2340
	#9 Gollum	165 June 14, 1982	2016	166 June 15, 1982 not working/ taking on water	0000
		174 June 23, 1982	1018	175 June 24, 1982	0100
<u>Endeavor 88</u>		225 August 13, 1982	0307	226 August 14, 1982	0831
		226 August 14, 1982	2218	231 August 19, 1982	2114

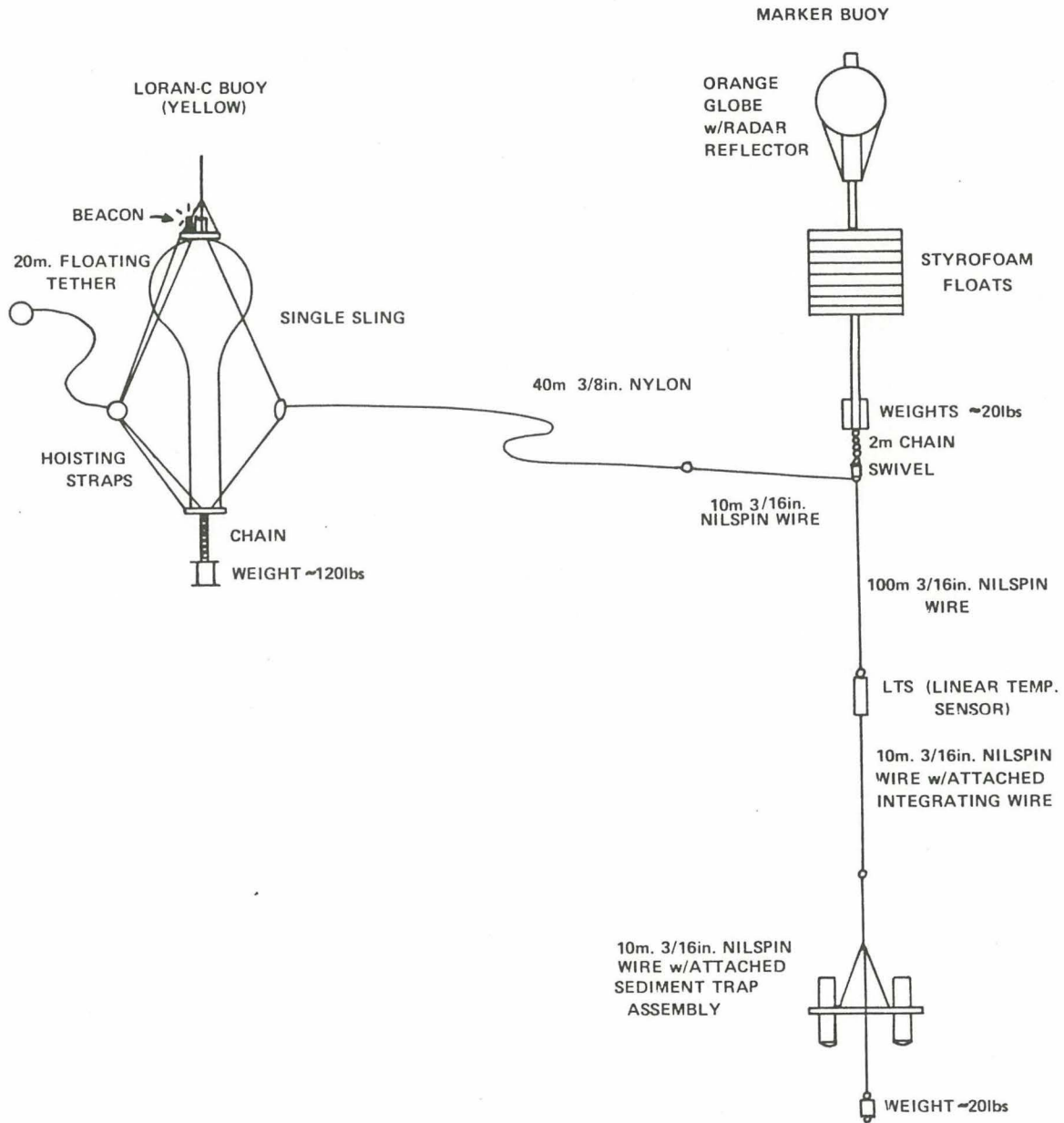


Figure 1a. LORAN-C drifter configuration used during the Warm Core Rings Experiment.

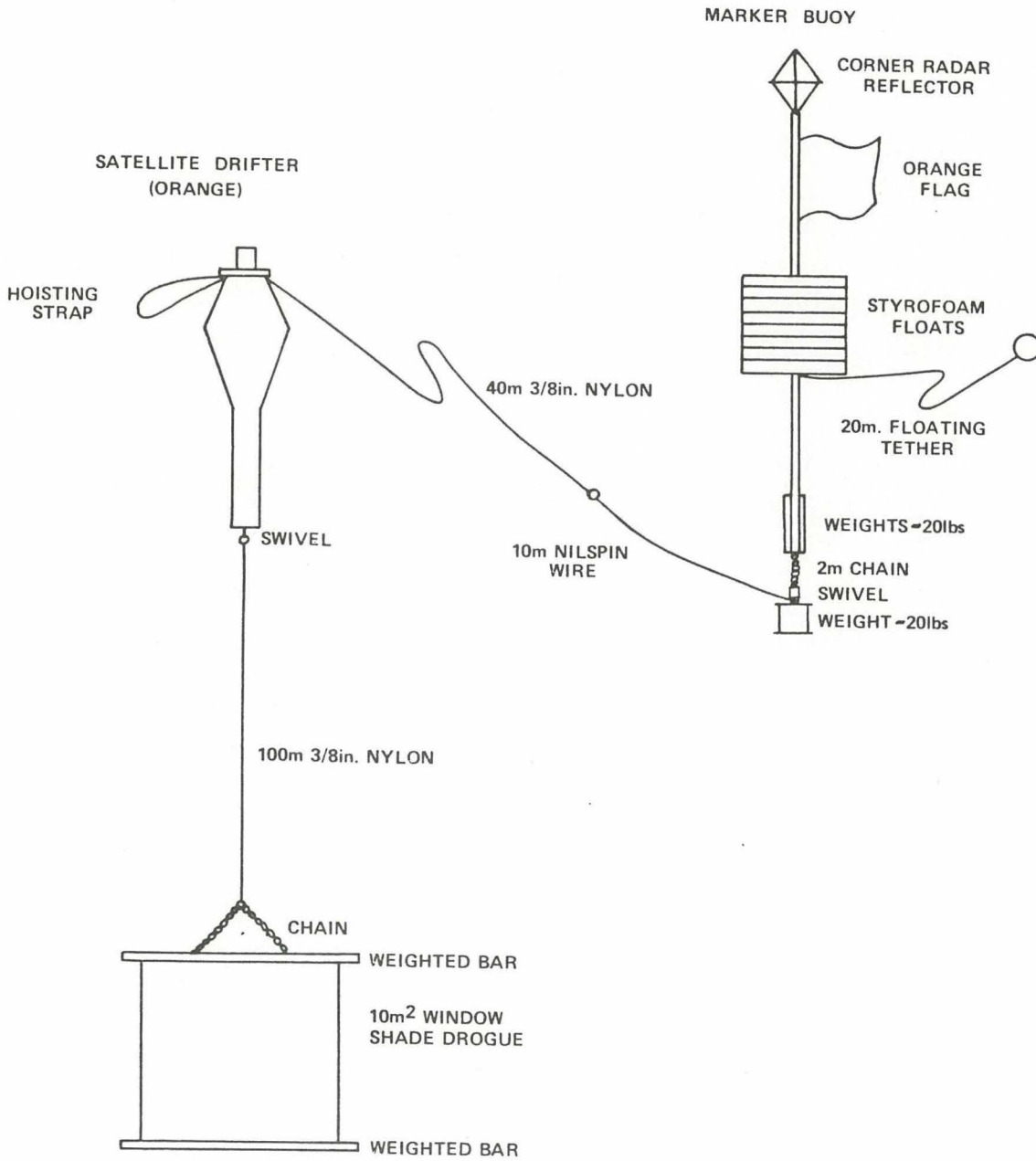


Figure 1b. Satellite drifter configuration used during the Warm Core Rings Experiment.

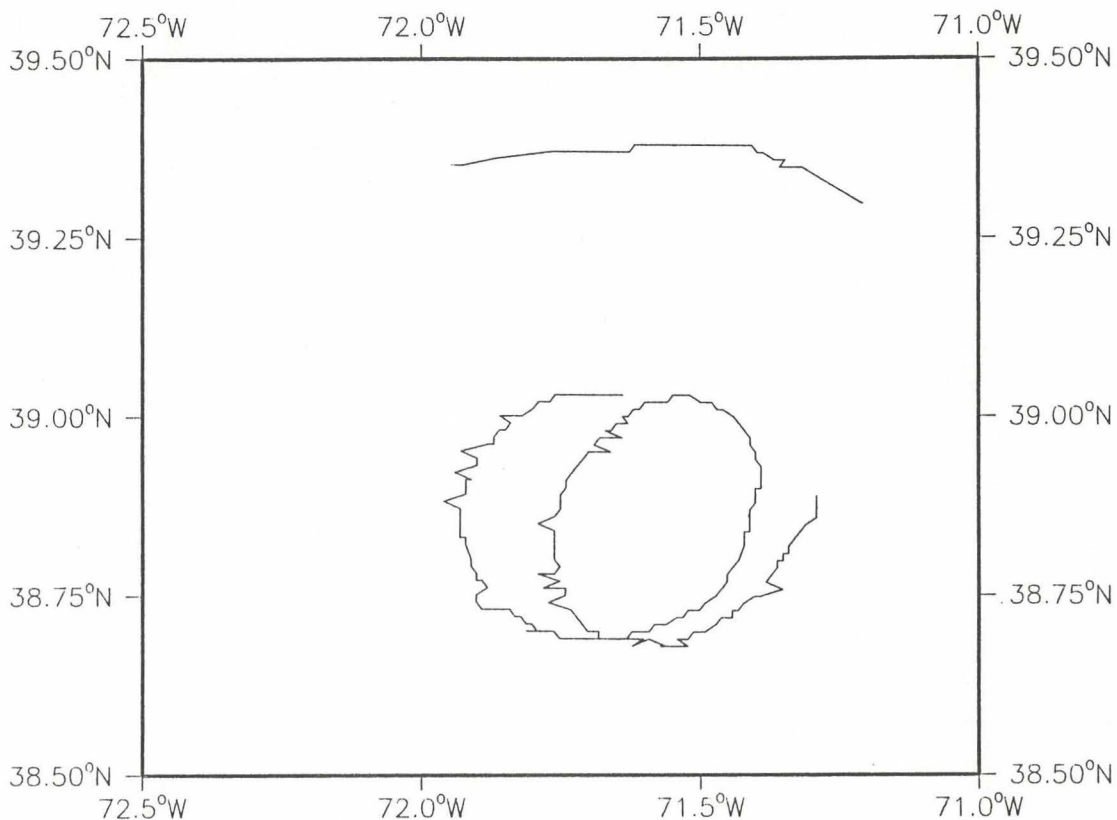


Figure 2a: Track of LORAN-C drifter deployed during Endeavor 83.

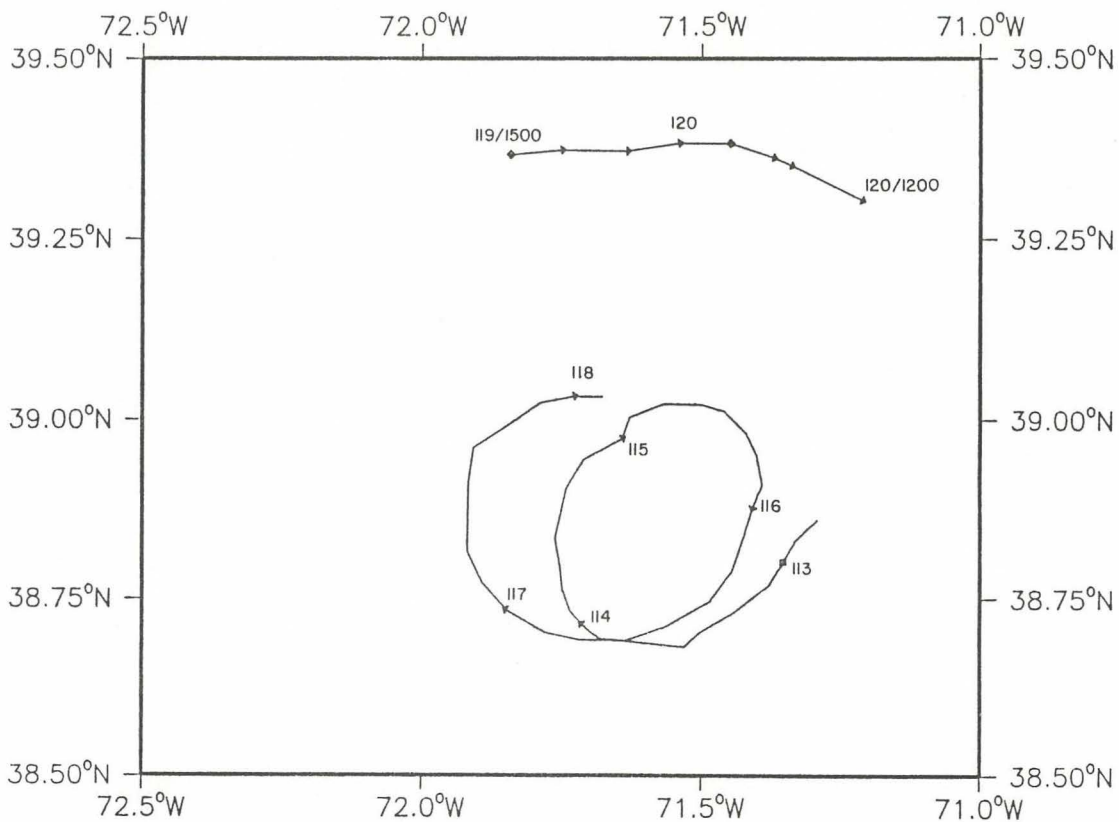


Figure 2b: Smoothed track of LORAN-C drifter deployed during Endeavor 83.

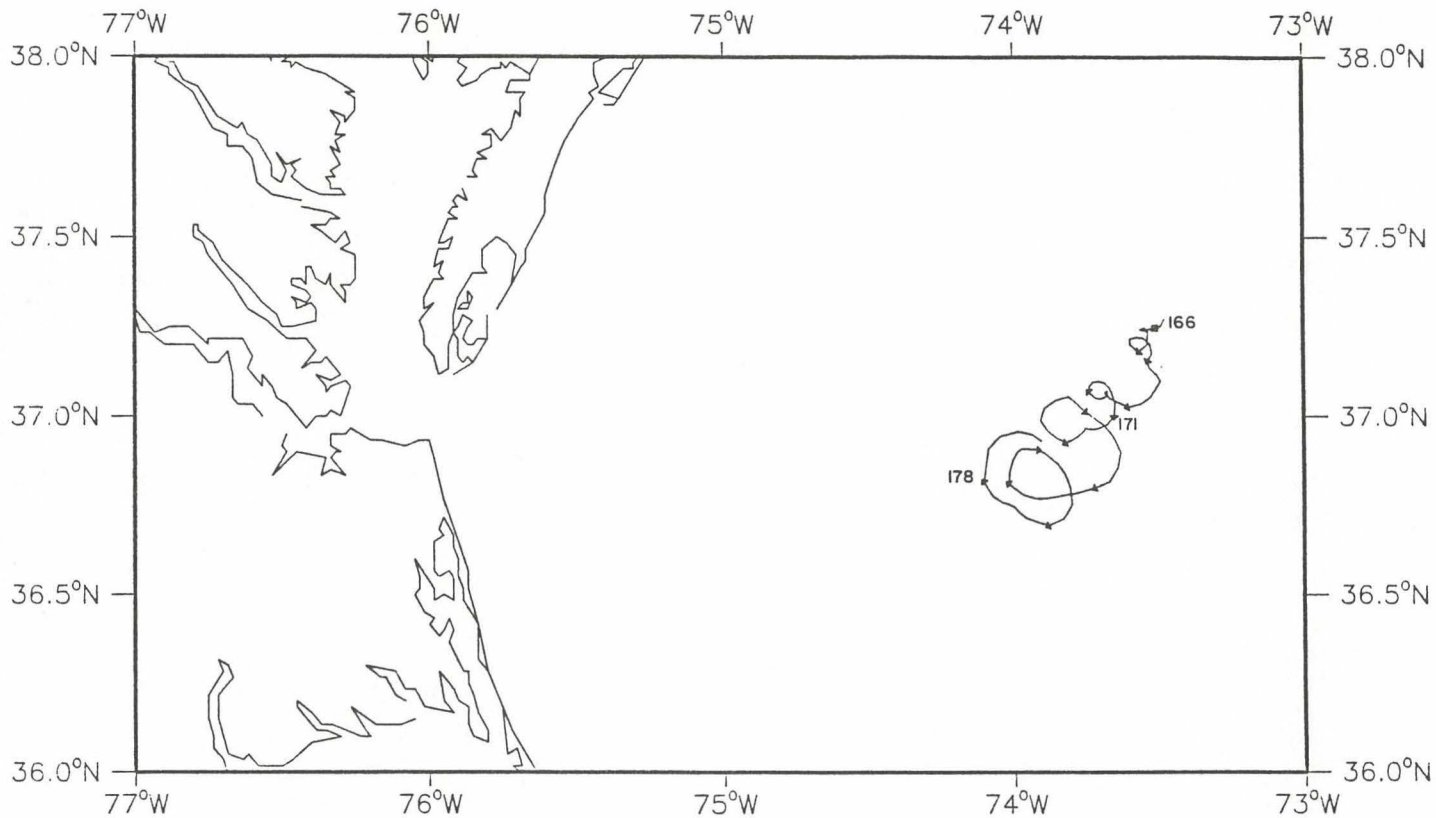


Figure 3: Smoothed surface track of Argos satellite drifter 02535 deployed in the estimated center of ring 82B on June 14 (year day 165) at 1528 GMT during cruise 86 of the R/V Endeavor. Arrows mark the positions at 0 GMT.



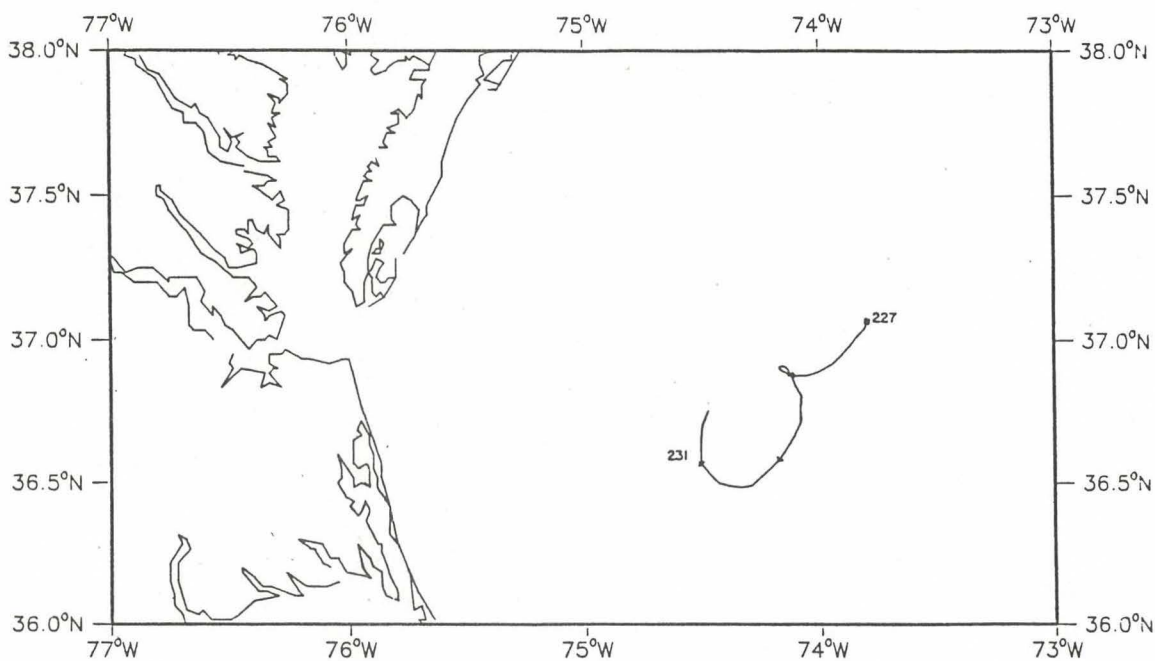


Figure 4a: Smoothed track of Argos satellite surface drifter 03482 deployed on August 14 (year day 226) at 2150 GMT in the estimated center of ring 82B during cruise 88 of the R/V Endeavor. Arrows mark the positions at 0 GMT.

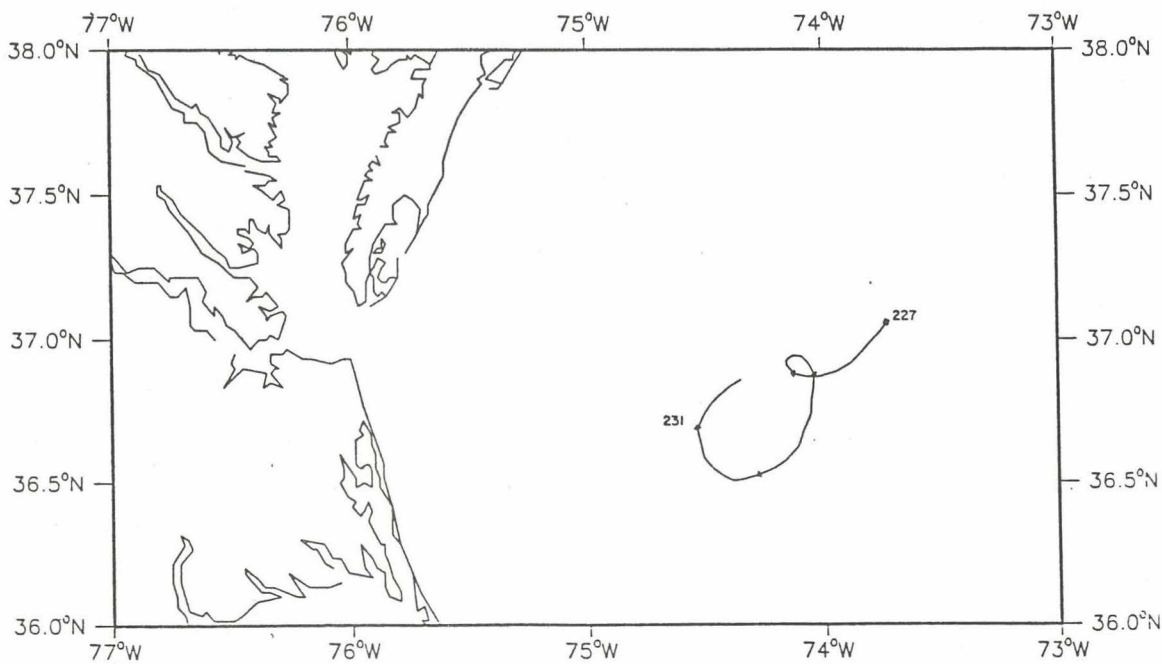


Figure 4b: Smoothed track of Argos satellite surface drifter 02535 deployed on August 14 (year day 226) at 2110 GMT in the estimated center of ring 82B during cruise 88 of the R/V Endeavor. Arrows mark the positions at 0 GMT.

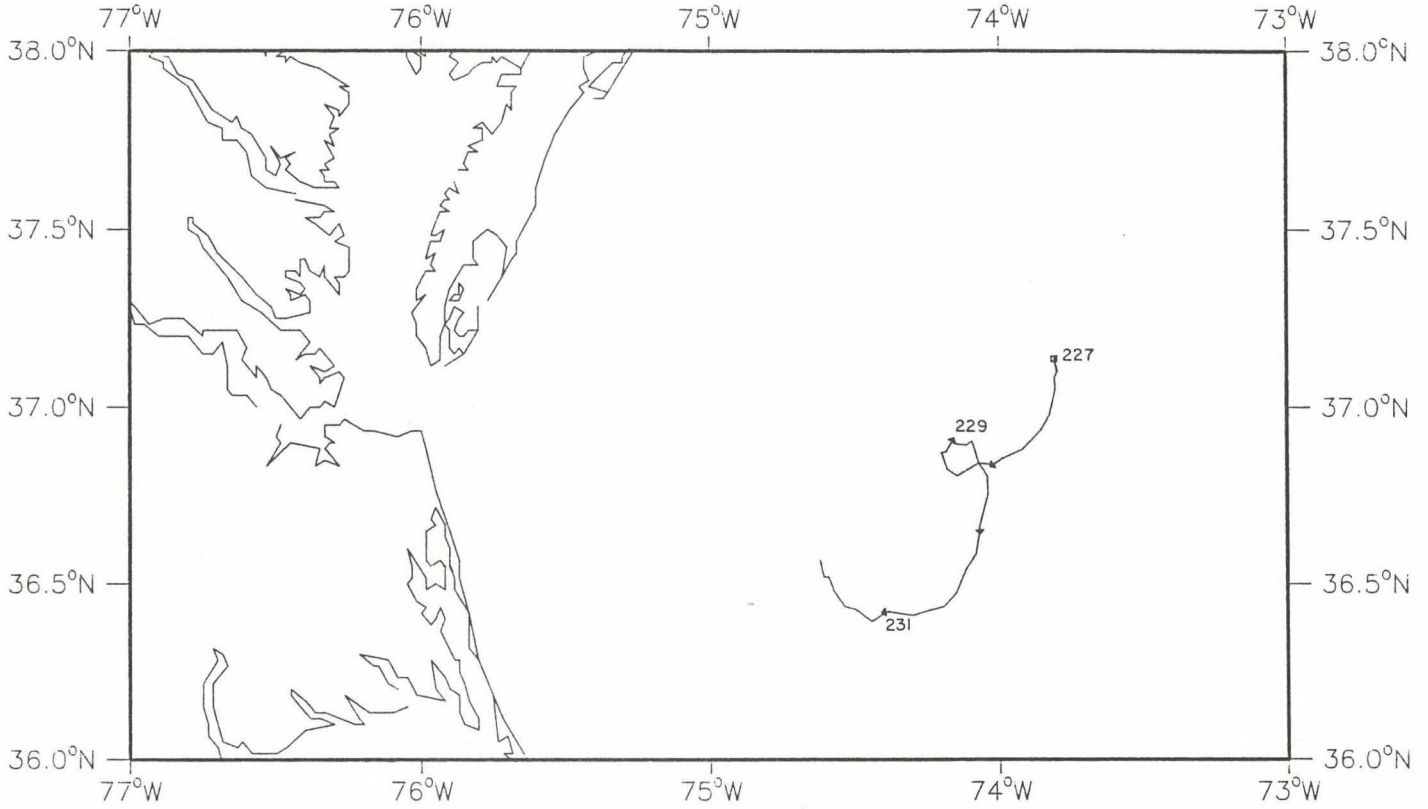


Figure 4c: Track of LORAN-C surface drifter deployed on August 14 (year day 226) at 2218 GMT in the estimated center of ring 82B during cruise 88 of the R/V Endeavor.

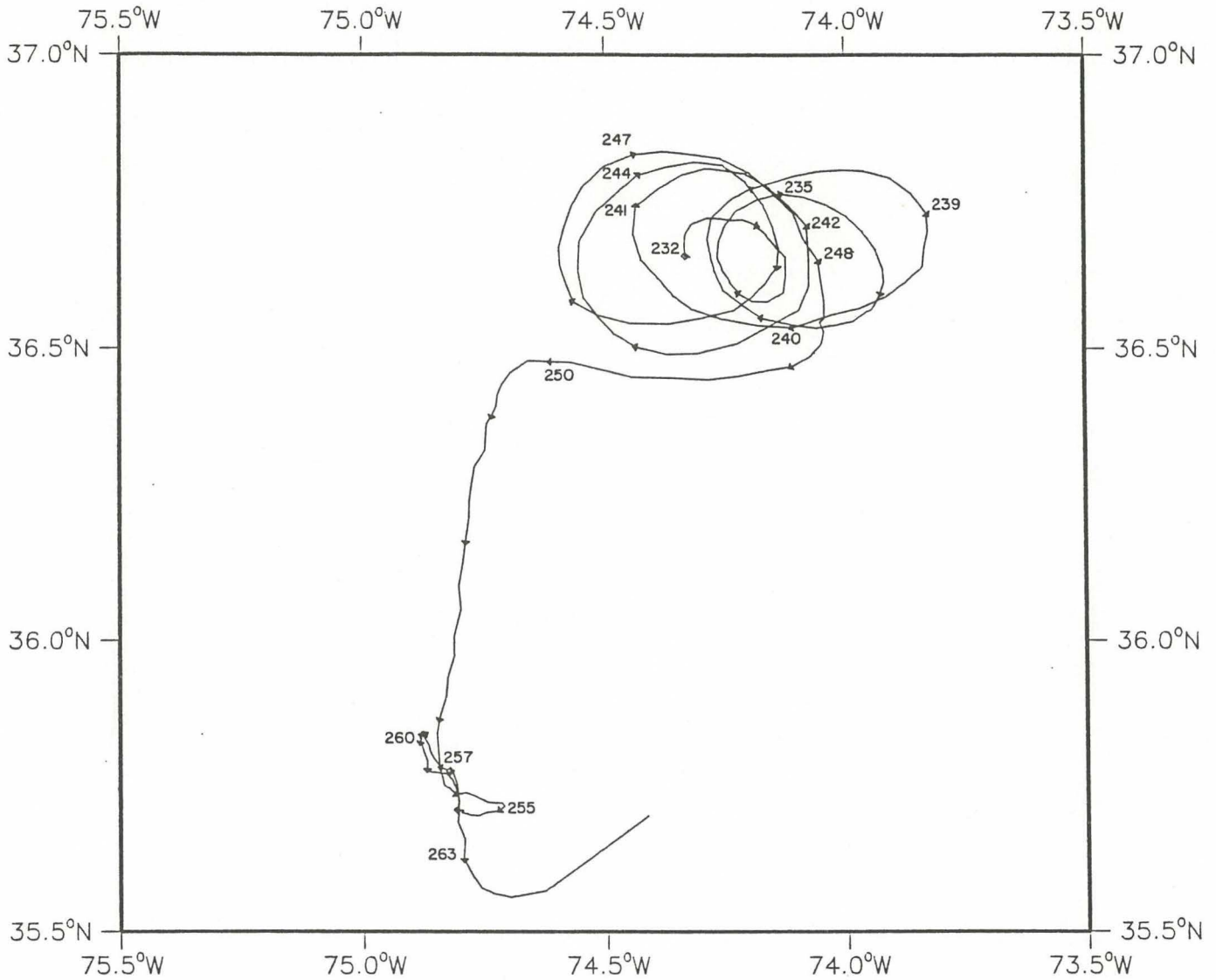


Figure 5: Partial track of satellite surface drifter 02535 deployed in the estimated center of ring 82B on August 19 (year day 231) at 1924 GMT during cruise 88 of the R/V Endeavor. Arrows mark the positions of the drifter at the beginning of each year day.

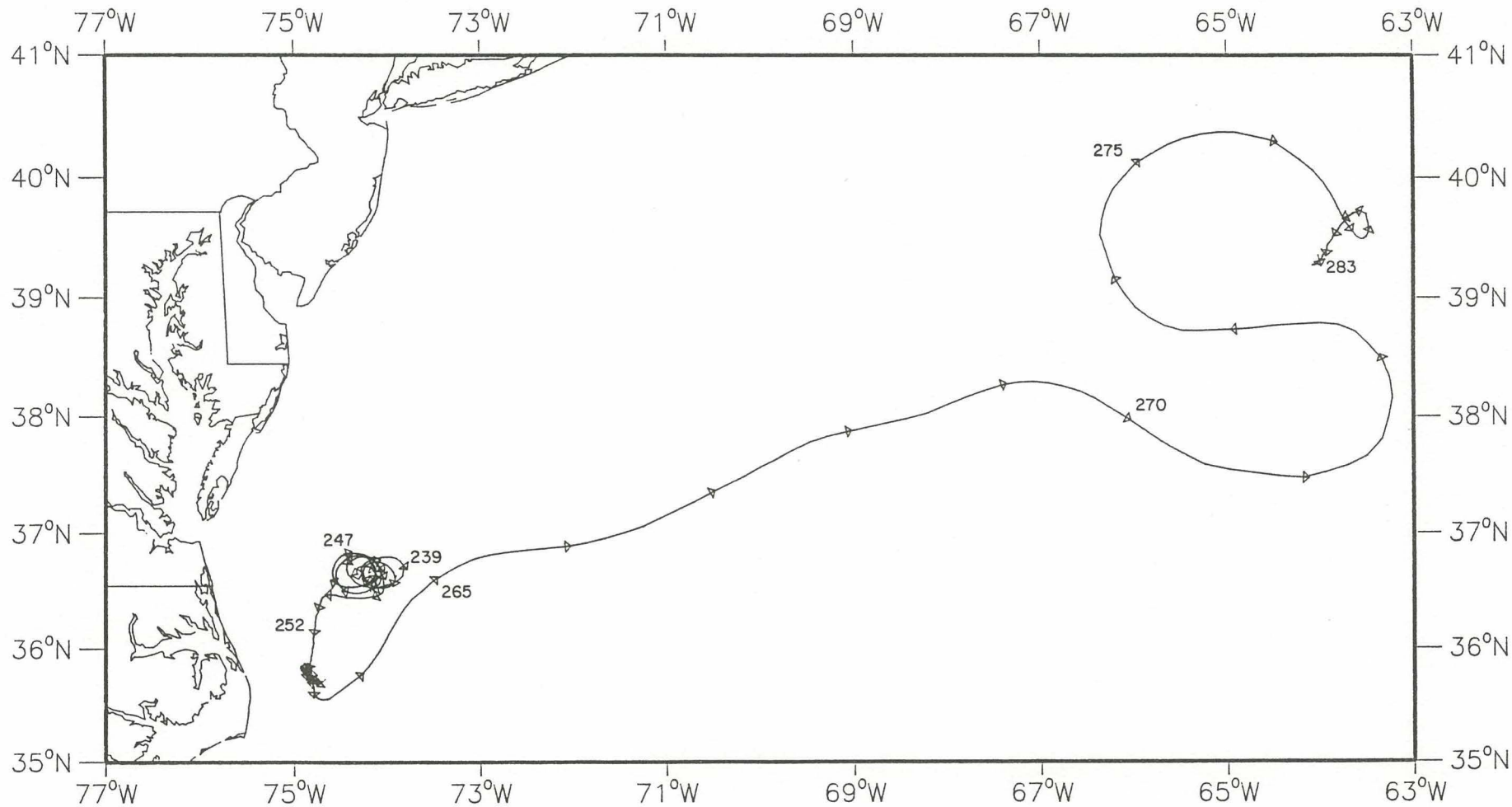


Figure 6: Entire track of satellite surface drifter 2535 deployed during cruise 88 of the R/V Endeavor. Track reflects the position of the Gulf Stream and the meanders/developing rings. Arrows, annotated with year days, mark the drifter positions at the beginning of each day (0 GMT).

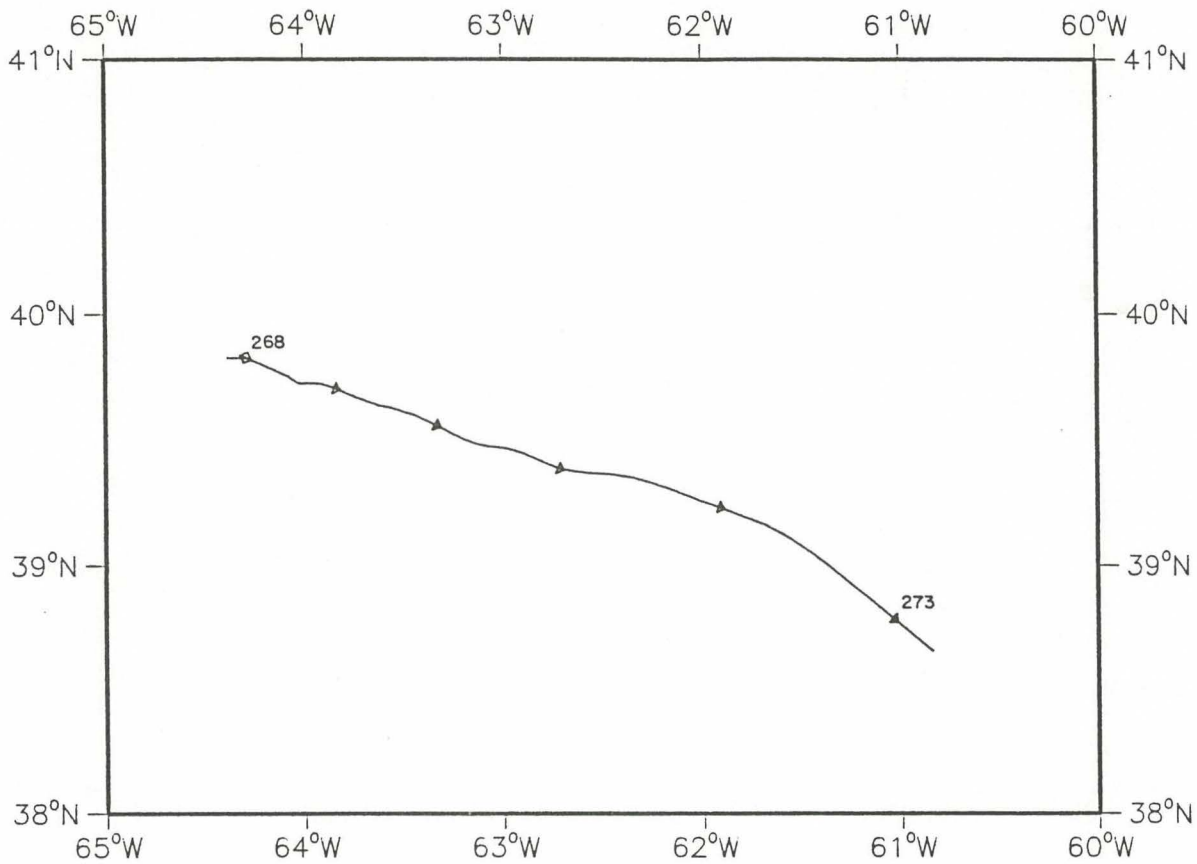


Figure 7: Track of Argos surface drifter 03481 deployed on September 24 (year day 267) at 2015 during cruise 90 of the R/V Endeavor. The track reflects the position of the Gulf Stream.



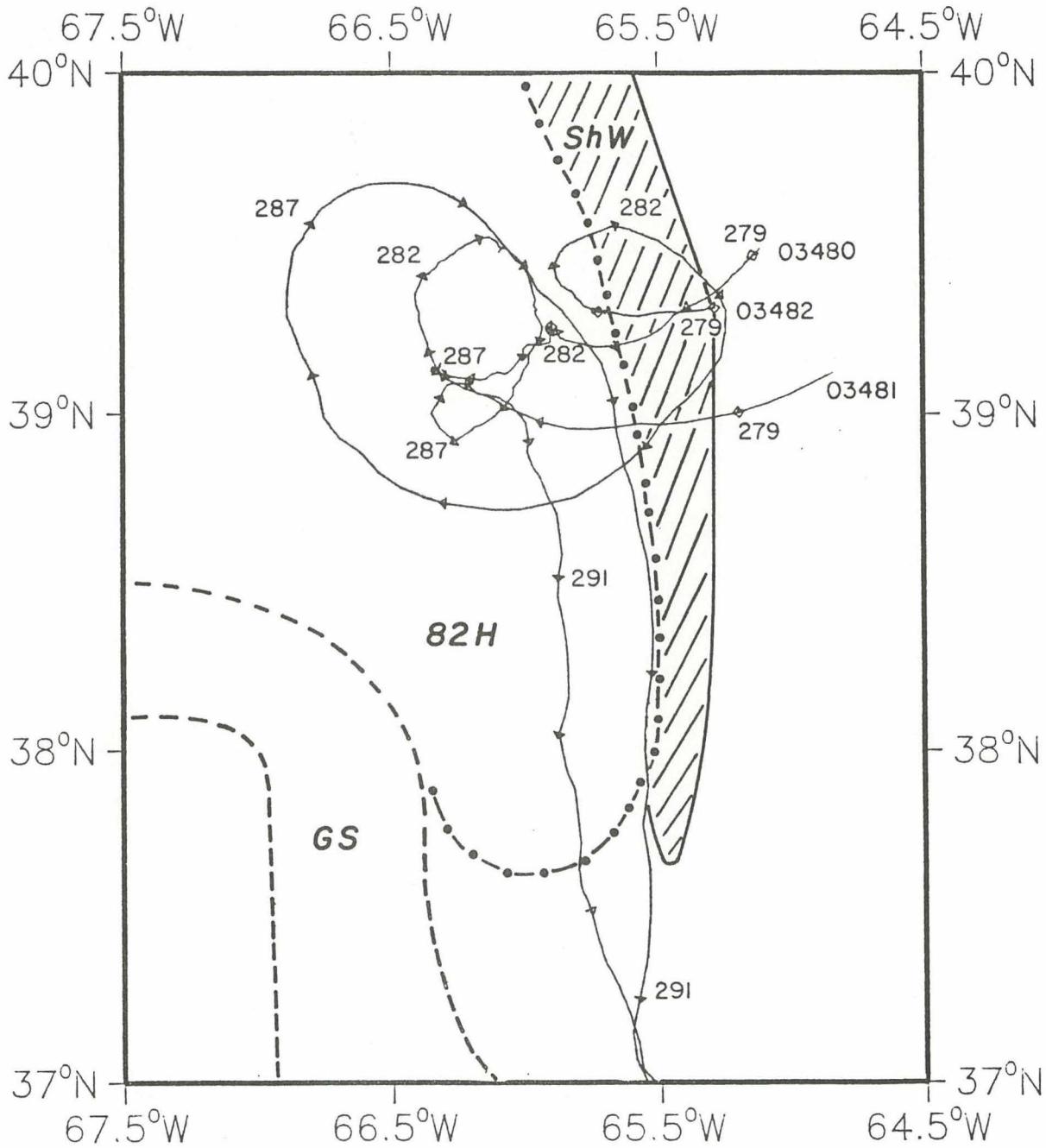


Figure 8: Tracks of three Argos surface drifters, 03480, 03481, and 03482, deployed in ring 82H during cruise 90 of the R/V Endeavor. Drifter 03480 is the best reflection of the ring center translation; drifters 03481 and 03482 reflect the anticyclonic rotation and westward movement of ring 82H. The Gulf Stream (GS), warm core ring (82H) and shelf water intrusion (ShW) positions on year day 291 have been added to delineate the dynamic interactions occurring as drifters 03481 and 03482 move southward.

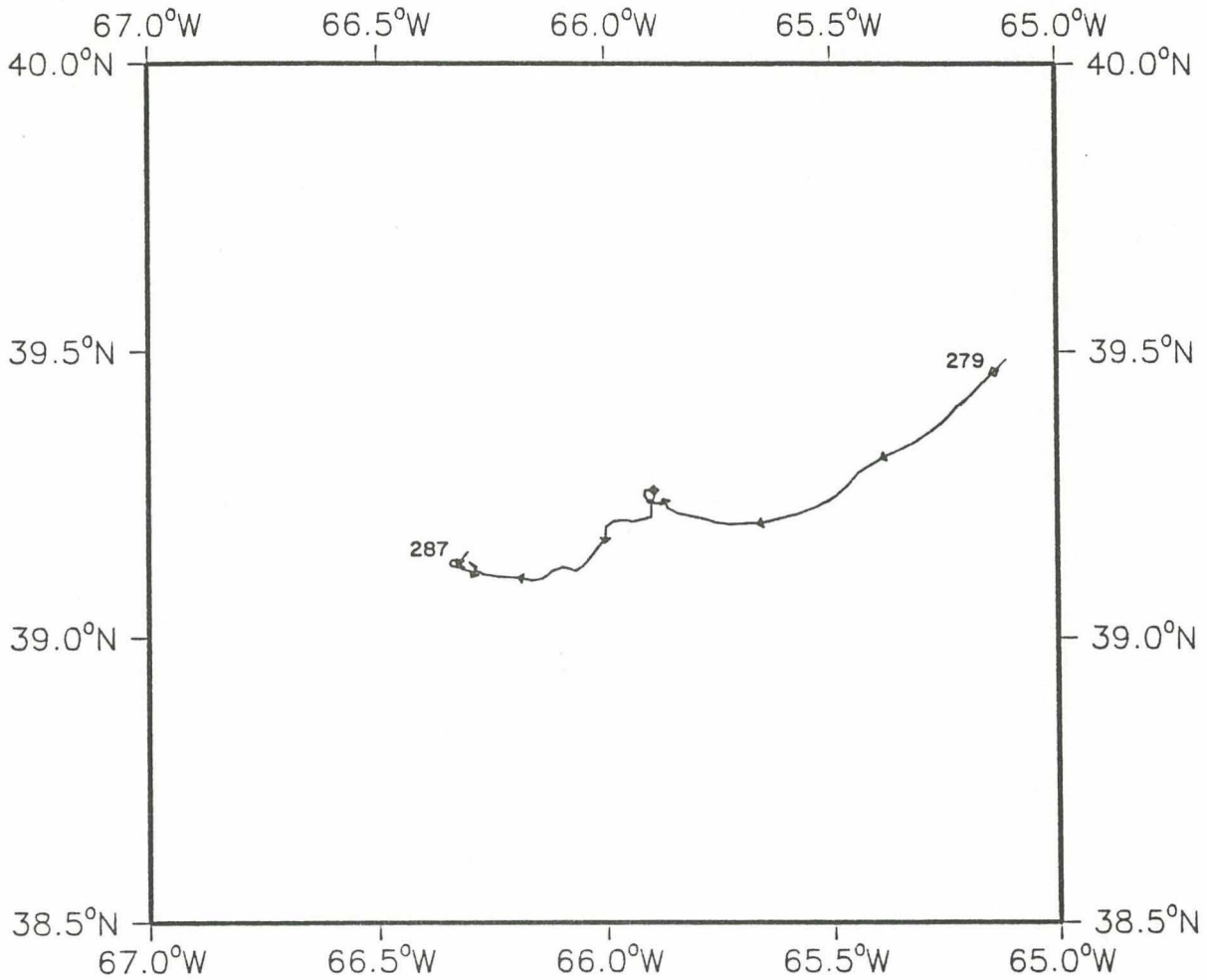


Figure 9: Track of Argos surface drifter 03480, deployed in the center of ring 82H on October 5 (year day 278) at 1525 GMT, during cruise 90 of the R/V Endeavor. Drifter 03480 provides the best estimate of ring center positions during this cruise.

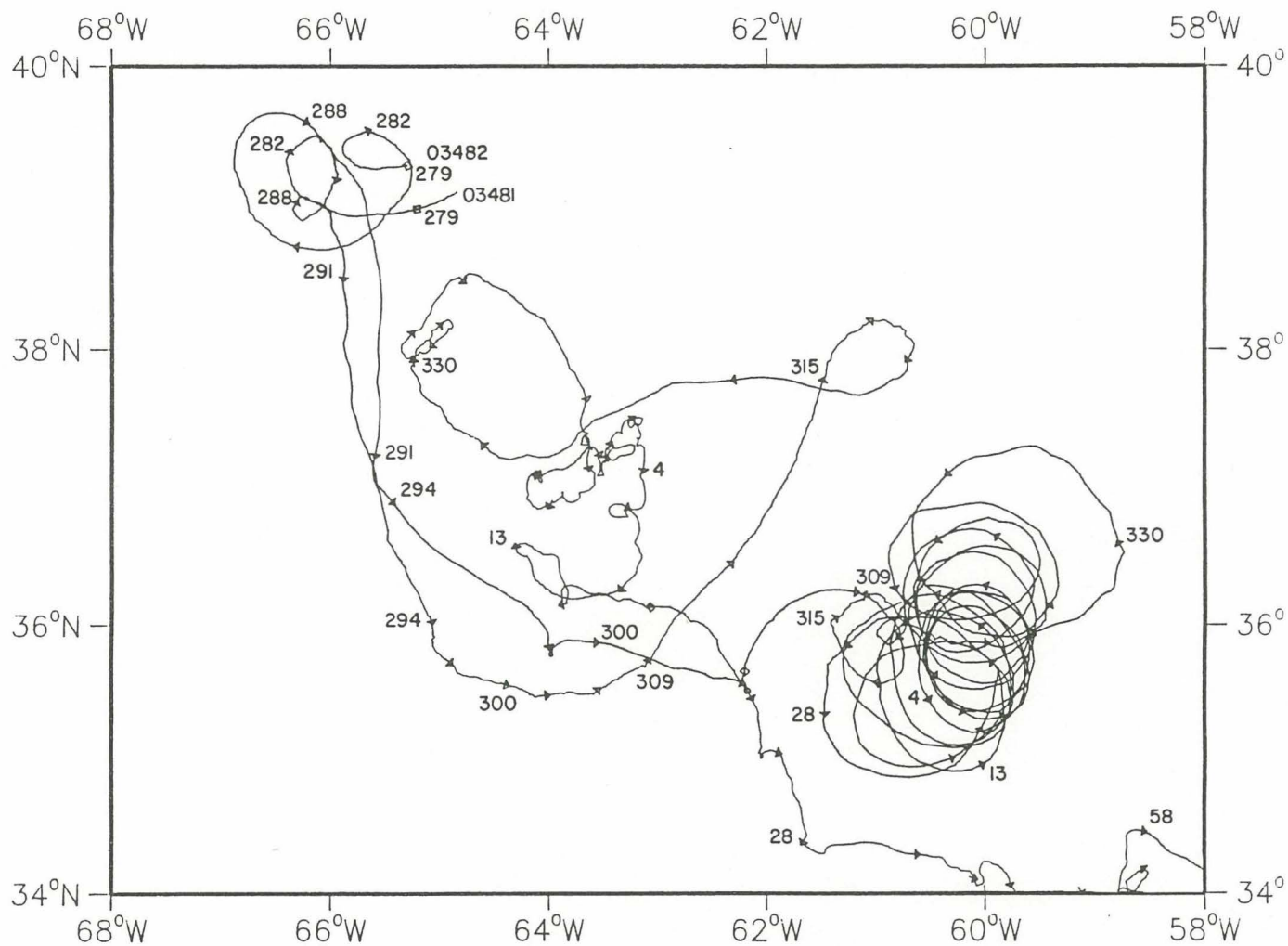


Figure 10: Tracks of Argos surface drifters 03481 and 03482 deployed in ring 82H on October 5 (year day 278) during cruise 90 of the R/V Endeavor. Arrows, some of which are annotated with the year day, mark the drifter position every three days at 0 GMT.

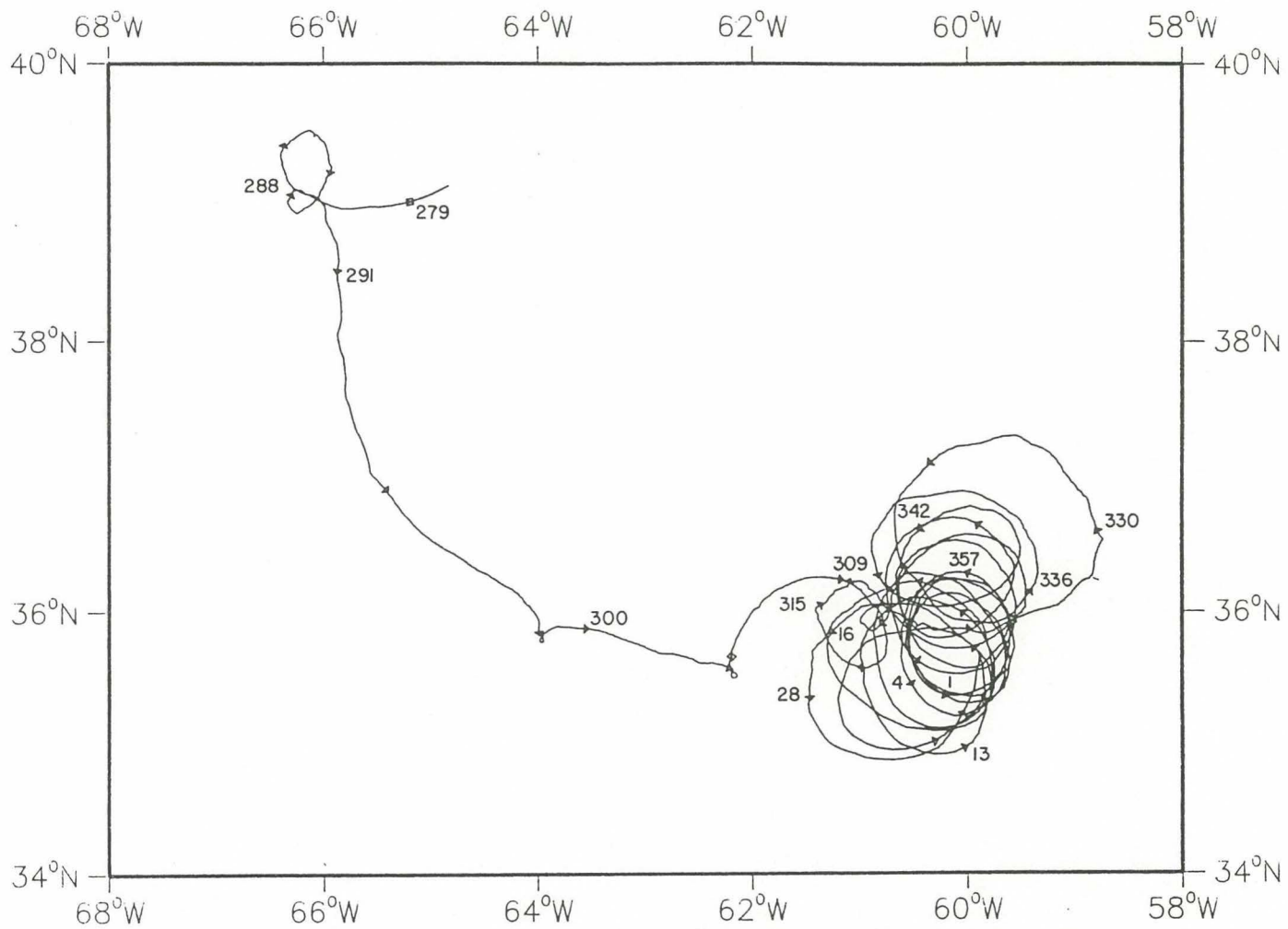


Figure 11: Entire track of Argos surface drifter 03481 deployed in ring 82H on October 5 (year day 278) at 1127 GMT. Arrows mark the position of the drifter every three days. The incorporation of the drifter in a cold core ring on day 321 is evident.

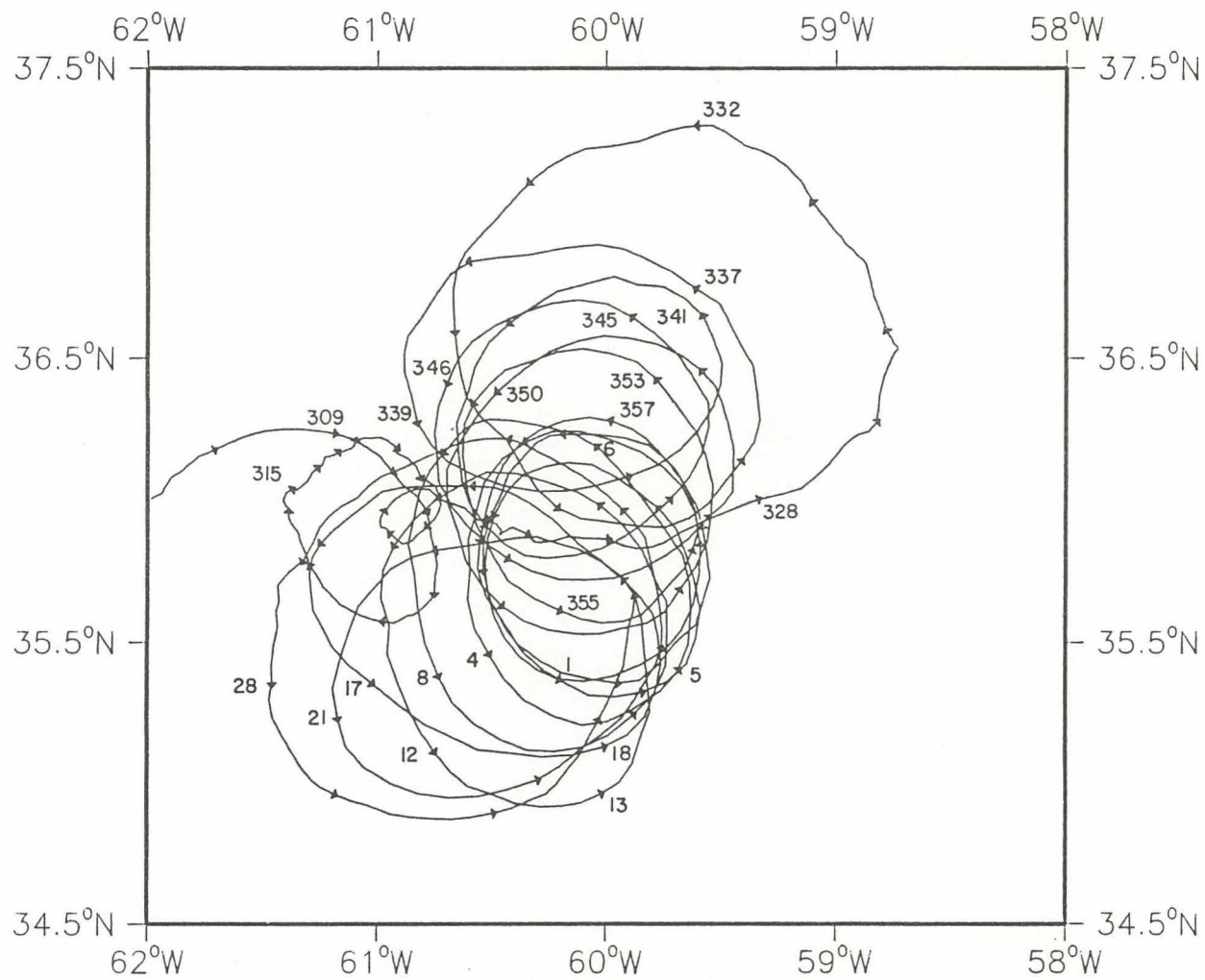


Figure 12: Track of Argos surface drifter 03481 in a cold core ring. Arrows mark the position of the drifter every 24 hours at 0 GMT; select arrows are annotated with the year day.

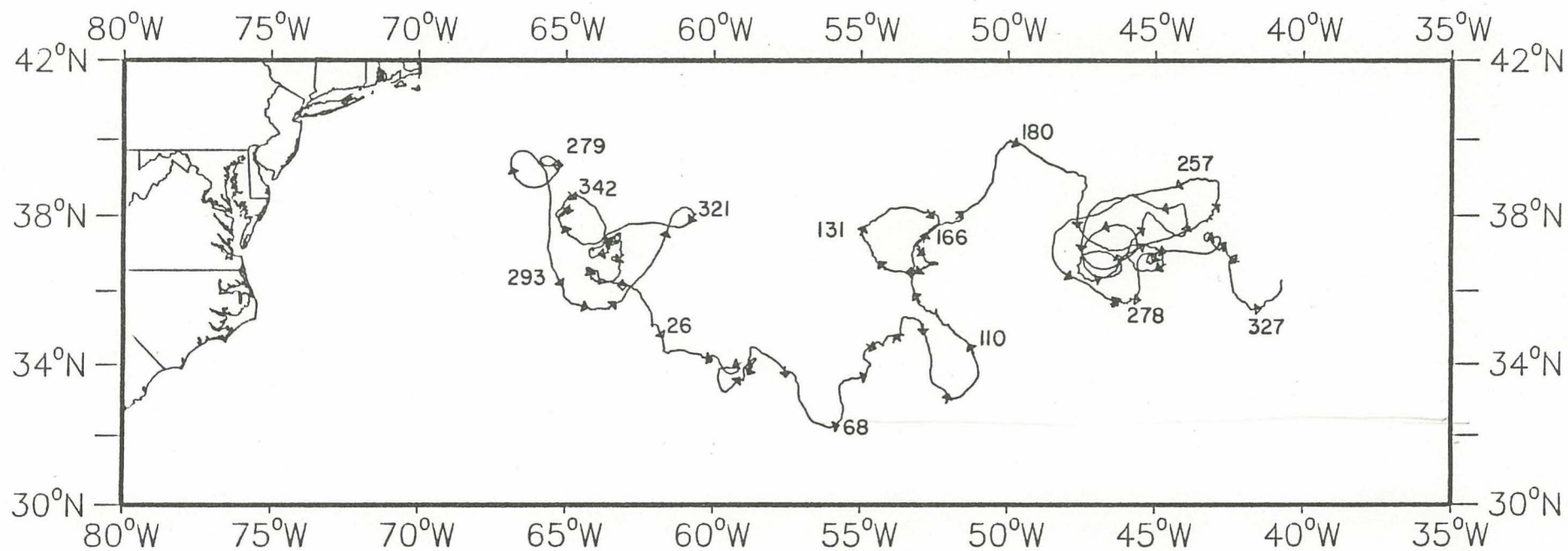


Figure 13: Entire track of Argos surface drifter 03482 in 1982 and 1983. Deployment occurred on October 5 (year day 278) at 2015 GMT. Arrows mark the positions of the drifter every seven days at 0 GMT; select arrows are annotated with the year day.



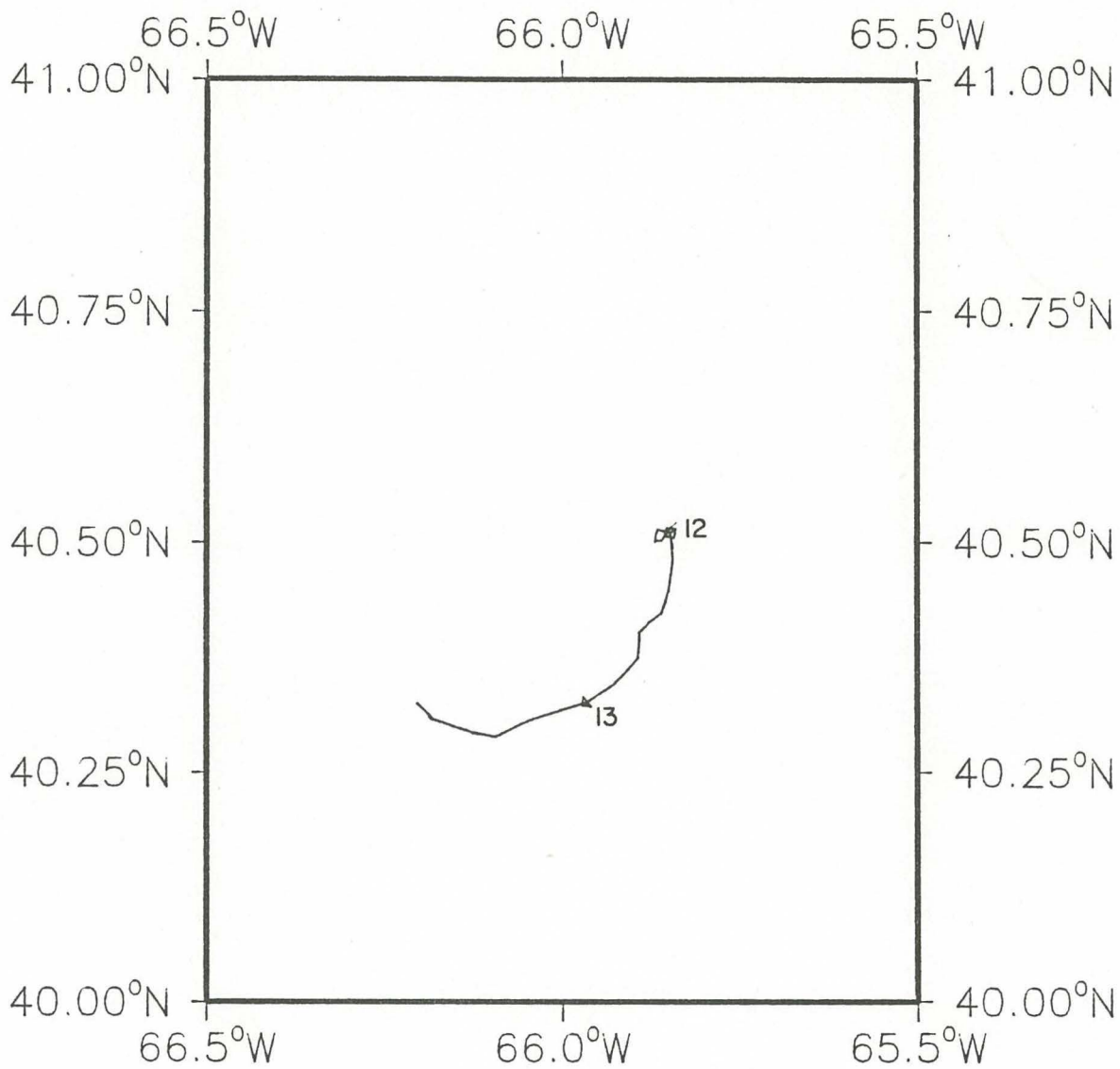


Figure 14: Track of Argos surface drifter 03480 deployed in ring 82I on 11 January 1983 at 0520 GMT from the USNS Bartlett.

Table 3.

Positions of Argos drifter 02535 Endeavor 86

SHIP: ENDEAVOR CRUISE: 86 DATES: JUNE 10 - 30, 1982  
 DRIFTER: 2535

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG
14	6	1710	37.277	-73.469
14	6	1857	37.263	-73.484
14	6	2037	37.250	-73.487
14	6	2221	37.248	-73.496
15	6	0714	37.238	-73.554
15	6	0901	37.242	-73.560
15	6	1217	37.248	-73.543
15	6	1404	37.239	-73.531
15	6	1839	37.214	-73.535
15	6	2025	37.205	-73.529
15	6	2337	37.182	-73.559
16	6	0122	37.181	-73.567
16	6	0702	37.204	-73.600
16	6	0849	37.216	-73.596
16	6	1154	37.221	-73.572
16	6	1341	37.224	-73.556
16	6	1827	37.197	-73.522
16	6	2012	37.180	-73.514
16	6	2313	37.161	-73.533
17	6	0059	37.153	-73.532
17	6	0650	37.143	-73.532
17	6	0838	37.136	-73.531
17	6	1311	37.108	-73.493
17	6	1450	37.099	-73.489
17	6	1815	37.050	-73.528
17	6	2001	37.039	-73.544
17	6	2250	37.025	-73.593
18	6	0036	37.026	-73.607
18	6	0639	37.053	-73.673
18	6	0926	37.063	-73.685
18	6	0958	37.075	-73.681
18	6	1247	37.071	-73.674
18	6	1432	37.059	-73.670
18	6	1803	37.049	-73.701
18	6	1950	37.051	-73.707
18	6	2226	37.055	-73.734
19	6	0147	37.082	-73.741
19	6	0626	37.099	-73.722
19	6	0947	37.098	-73.697
19	6	1224	37.092	-73.682
19	6	1408	37.083	-73.670
19	6	1751	37.069	-73.661
19	6	1938	37.051	-73.647
19	6	2343	37.006	-73.652
20	6	0129	36.983	-73.660
20	6	0614	36.965	-73.715
20	6	0940	36.965	-73.740
20	6	1201	36.968	-73.755
20	6	1347	36.968	-73.749
20	6	1740	36.956	-73.761
20	6	2319	36.928	-73.811
21	6	0106	36.928	-73.832
21	6	0743	36.974	-73.902
21	6	0929	36.998	-73.909
21	6	1137	37.022	-73.897

Table 3. (cont.)

21	6	1323	172	37.037	-73.877
21	6	1728	172	37.061	-73.816
21	6	2049	172	37.033	-73.775
21	6	2257	172	37.021	-73.765
22	6	0041	173	37.012	-73.749
22	6	0731	173	36.986	-73.705
22	6	0918	173	36.973	-73.683
22	6	1113	173	36.955	-73.664
22	6	1433	173	36.906	-73.631
22	6	1716	173	36.864	-73.634
22	6	1902	173	36.836	-73.660
22	6	2041	173	36.820	-73.667
22	6	2234	173	36.805	-73.702
23	6	0719	174	36.781	-73.806
23	6	0907	174	36.782	-73.822
23	6	1410	174	36.775	-73.866
23	6	1844	174	36.770	-73.932
23	6	2030	174	36.778	-73.958
23	6	2211	174	36.790	-73.993
23	6	2355	174	36.812	-74.017
24	6	0129	175	36.832	-74.017
24	6	0133	175	36.833	-74.021
24	6	0707	175	36.893	-73.999
24	6	0854	175	36.904	-73.986
24	6	1206	175	36.911	-73.975
24	6	1353	175	36.913	-73.967
24	6	1832	175	36.910	-73.943
24	6	2018	175	36.910	-73.933
24	6	2326	175	36.909	-73.926
25	6	0112	176	36.908	-73.909
25	6	0655	176	36.880	-73.865
25	6	0843	176	36.869	-73.849
25	6	1144	176	36.844	-73.828
25	6	1329	176	36.824	-73.809
25	6	1820	176	36.749	-73.800
25	6	2007	176	36.723	-73.817
25	6	2302	176	36.697	-73.868
26	6	0048	177	36.697	-73.894
26	6	0644	177	36.721	-73.971
26	6	0830	177	36.731	-73.981
26	6	1120	177	36.747	-73.996
26	6	1439	177	36.757	-74.021
26	6	1808	177	36.761	-74.041
26	6	1955	177	36.768	-74.053
26	6	2240	177	36.796	-74.103
27	6	0025	178	36.825	-74.103
27	6	0631	178	36.921	-74.086
27	6	0953	178	36.958	-74.030
27	6	1236	178	36.960	-73.972
27	6	1422	178	36.954	-73.941
27	6	1757	178	36.933	-73.906
27	6	1944	178	36.927	-73.886

Table 4.

Positions of Argos drifter 03482 Endeavor 88

SHIP: ENDEAVOR CRUISE: 88 DATES: AUGUST 5 - 25, 1982  
DRIFTER: 3482

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG
14 8	2330	226	37.071	-73.802
15 8	0117	227	37.057	-73.792
15 8	0651	227	37.004	-73.853
15 8	0838	227	36.985	-73.869
15 8	1148	227	36.952	-73.906
15 8	1335	227	36.931	-73.920
15 8	1816	227	36.887	-74.014
15 8	2002	227	36.879	-74.040
15 8	2307	227	36.874	-74.107
16 8	0053	228	36.879	-74.127
16 8	0639	228	36.893	-74.164
16 8	0827	228	36.895	-74.163
16 8	0959	228	36.898	-74.174
16 8	1124	228	36.899	-74.175
16 8	1444	228	36.907	-74.175
16 8	1804	228	36.911	-74.160
16 8	1951	228	36.907	-74.143
16 8	2245	228	36.892	-74.135
17 8	0030	229	36.880	-74.124
17 8	0627	229	36.835	-74.102
17 8	0948	229	36.800	-74.077
17 8	1241	229	36.757	-74.087
17 8	1426	229	36.721	-74.080
17 8	1932	229	36.637	-74.127
17 8	2117	229	36.615	-74.149
17 8	2219	229	36.603	-74.153
18 8	0140	230	36.567	-74.190
18 8	0756	230	36.500	-74.279
18 8	0942	230	36.485	-74.297
18 8	1218	230	36.483	-74.343
18 8	1404	230	36.484	-74.374
18 8	1740	230	36.495	-74.432
18 8	2101	230	36.527	-74.471
18 8	2337	230	36.558	-74.508
19 8	0121	231	36.583	-74.510
19 8	0744	231	36.681	-74.509
19 8	0930	231	36.710	-74.501
19 8	1154	231	36.748	-74.481
19 8	1335	231	36.775	-74.469

Table 5.

Positions of Argos drifter 02535 Endeavor 88

SHIP: ENDFAVOR CRUISE: 88 DATES: AUGUST 5 - 25, 1982  
 DRIFTER: 2535

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG	
14	8	2330	226	37.064	-73.731
15	8	0116	227	37.045	-73.740
15	8	0651	227	36.983	-73.816
15	8	0839	227	36.961	-73.836
15	8	1148	227	36.921	-73.885
15	8	1333	227	36.899	-73.912
15	8	1916	227	36.868	-74.034
15	8	2003	227	36.870	-74.064
15	8	2307	227	36.874	-74.120
16	8	0053	228	36.885	-74.134
16	8	0639	228	36.912	-74.162
16	8	0926	228	36.921	-74.161
16	8	0959	228	36.932	-74.165
16	8	1124	228	36.932	-74.156
16	8	1443	228	36.944	-74.135
16	8	1804	228	36.940	-74.095
16	8	1951	228	36.928	-74.076
16	8	2245	228	36.900	-74.056
17	8	0030	229	36.873	-74.039
17	8	0626	229	36.785	-74.056
17	8	0948	229	36.727	-74.058
17	8	1241	229	36.673	-74.095
17	8	1426	229	36.633	-74.102
17	8	1753	229	36.577	-74.167
17	8	1939	229	36.560	-74.189
18	8	0000	230	36.528	-74.278
18	8	0756	230	36.505	-74.376
18	8	0941	230	36.507	-74.406
18	8	1218	230	36.526	-74.440
18	8	1403	230	36.537	-74.465
18	8	1741	230	36.582	-74.512
18	8	2101	230	36.638	-74.528
18	8	2336	230	36.679	-74.544
19	8	0122	231	36.713	-74.532
19	8	0744	231	36.799	-74.464
19	8	0930	231	36.812	-74.437
19	8	1154	231	36.835	-74.405
19	8	1334	231	36.849	-74.384
19	8	1728	231	36.877	-74.312



Table 6.

Positions of Argos drifter 02535;  
Second deployment Endeavor 88

SHIP: ENDFAVOR CRUISE: 88 DATES: AUGUST 5 - 25, 1982  
DRIFTER: 2535

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG	
19	8	2049	231	36.655	-74.322
19	8	2319	231	36.656	-74.332
20	8	0053	232	36.658	-74.335
20	8	0732	232	36.702	-74.333
20	8	0917	232	36.713	-74.317
20	8	1130	232	36.723	-74.295
20	8	1317	232	36.721	-74.267
20	8	1856	232	36.718	-74.234
20	8	2042	232	36.719	-74.215
20	8	2250	232	36.716	-74.202
21	8	0036	233	36.707	-74.178
21	8	0720	233	36.667	-74.138
21	8	0907	233	36.654	-74.122
21	8	1107	233	36.635	-74.123
21	8	1432	233	36.597	-74.122
21	8	1845	233	36.575	-74.172
21	8	2031	233	36.579	-74.189
21	8	2226	233	36.584	-74.211
22	8	0146	234	36.603	-74.234
22	8	0708	234	36.642	-74.262
22	8	0856	234	36.653	-74.266
22	8	1224	234	36.685	-74.263
22	8	1409	234	36.700	-74.258
22	8	1833	234	36.738	-74.224
22	8	2019	234	36.750	-74.194
22	8	2343	234	36.763	-74.141
23	8	0128	235	36.765	-74.108
23	8	0656	235	36.738	-74.022
23	8	0843	235	36.727	-74.000
23	8	1200	235	36.698	-73.964
23	8	1340	235	36.681	-73.942
23	8	1827	235	36.629	-73.919
23	8	2001	235	36.618	-73.916
23	8	2319	235	36.597	-73.925
24	8	0105	236	36.589	-73.928
24	8	0644	236	36.562	-73.946
24	8	1000	236	36.562	-73.961
24	8	1004	236	36.561	-73.962
24	8	1137	236	36.547	-73.980
24	8	1323	236	36.543	-73.992
24	8	1909	236	36.534	-74.063
24	8	1955	236	36.537	-74.087
24	8	2256	236	36.544	-74.155
25	8	0042	237	36.555	-74.186
25	8	0632	237	36.603	-74.262
25	8	0953	237	36.643	-74.277
25	8	1112	237	36.648	-74.278
25	8	1432	237	36.679	-74.288
25	8	1758	237	36.722	-74.278
25	8	1944	237	36.743	-74.253
25	8	2232	237	36.765	-74.220
26	8	0801	238	36.801	-74.075
26	8	0946	238	36.801	-74.042
26	8	1236	238	36.803	-74.000
26	8	1410	238	36.804	-73.977



Table 6. (cont.)

26	8	1745	238	36.791	-73.908
26	8	2106	238	36.752	-73.859
26	8	2349	238	36.732	-73.829
27	8	0134	239	36.713	-73.822
27	8	0749	239	36.652	-73.837
27	8	0935	239	36.632	-73.837
27	8	1207	239	36.615	-73.870
27	8	1352	239	36.597	-73.890
27	8	1732	239	36.570	-73.959
27	8	2054	239	36.557	-74.029
27	8	2325	239	36.537	-74.094
28	8	0111	240	36.532	-74.139
28	8	0737	240	36.556	-74.301
28	8	0923	240	36.569	-74.325
28	8	1143	240	36.586	-74.355
28	8	1330	240	36.604	-74.372
28	8	1902	240	36.661	-74.437
28	8	2047	240	36.690	-74.441
28	8	2302	240	36.728	-74.445
29	8	0048	241	36.752	-74.426
29	8	0725	241	36.806	-74.319
29	8	0910	241	36.806	-74.288
29	8	1120	241	36.802	-74.257
29	8	1438	241	36.800	-74.213
29	8	1849	241	36.766	-74.144
29	8	2032	241	36.745	-74.120
29	8	2239	241	36.729	-74.093
30	8	0024	242	36.703	-74.075
30	8	0713	242	36.585	-74.075
30	8	0901	242	36.565	-74.096
30	8	1237	242	36.532	-74.171
30	8	1421	242	36.512	-74.207
30	8	1837	242	36.487	-74.326
30	8	2024	242	36.489	-74.361
30	8	2215	242	36.490	-74.399
31	8	0139	243	36.511	-74.468
31	8	0701	243	36.562	-74.524
31	8	0849	243	36.582	-74.542
31	8	1212	243	36.634	-74.555
31	8	1358	243	36.664	-74.563
31	8	1826	243	36.738	-74.513
31	8	2011	243	36.759	-74.479
31	8	2331	243	36.790	-74.441
1	9	0116	244	36.803	-74.409
1	9	0649	244	36.820	-74.299
1	9	0837	244	36.814	-74.259
1	9	1149	244	36.785	-74.210
1	9	1336	244	36.762	-74.180
1	9	1820	244	36.701	-74.147
1	9	1954	244	36.682	-74.137
1	9	2307	244	36.648	-74.140
2	9	0054	245	36.631	-74.142
2	9	0637	245	36.584	-74.198
2	9	0958	245	36.557	-74.245
2	9	1125	245	36.554	-74.281
2	9	1445	245	36.541	-74.363
2	9	1802	245	36.542	-74.452
2	9	1949	245	36.549	-74.490
2	9	2245	245	36.567	-74.557
3	9	0031	246	36.582	-74.567
3	9	0625	246	36.644	-74.593

Table 6. (cont.)

3	9	0946	246	36.679	-74.593
3	9	1242	246	36.712	-74.579
3	9	1426	246	36.733	-74.572
3	9	1751	246	36.771	-74.547
3	9	1937	246	36.795	-74.523
3	9	2221	246	36.822	-74.478
4	9	0141	247	36.837	-74.405
4	9	0801	247	36.827	-74.283
4	9	0934	247	36.821	-74.247
4	9	1218	247	36.795	-74.192
4	9	1404	247	36.774	-74.165
4	9	1738	247	36.735	-74.108
4	9	2059	247	36.688	-74.087
4	9	2337	247	36.654	-74.057
5	9	0123	248	36.630	-74.053
5	9	0742	248	36.562	-74.041
5	9	0928	248	36.547	-74.045
5	9	1154	248	36.545	-74.053
5	9	1341	248	36.536	-74.045
5	9	1727	248	36.512	-74.046
5	9	2053	248	36.487	-74.071
5	9	2314	248	36.470	-74.103
6	9	0059	249	36.468	-74.122
6	9	0730	249	36.447	-74.254
6	9	0917	249	36.446	-74.293
6	9	1131	249	36.449	-74.355
6	9	1450	249	36.451	-74.442
6	9	1451	249	36.449	-74.442
6	9	1854	249	36.468	-74.537
6	9	2041	249	36.475	-74.568
6	9	2251	249	36.475	-74.598
7	9	0037	250	36.477	-74.616
7	9	0718	250	36.478	-74.667
7	9	0905	250	36.470	-74.671
7	9	1248	250	36.454	-74.700
7	9	1433	250	36.438	-74.711
7	9	1842	250	36.416	-74.722
7	9	2029	250	36.404	-74.723
7	9	2227	250	36.390	-74.724
8	9	0147	251	36.378	-74.742
8	9	0706	251	36.342	-74.746
8	9	0854	251	36.325	-74.746
8	9	1225	251	36.293	-74.771
8	9	1411	251	36.277	-74.773
8	9	1830	251	36.234	-74.780
8	9	2017	251	36.219	-74.778
8	9	2344	251	36.173	-74.787
9	9	0129	252	36.150	-74.789
9	9	0654	252	36.083	-74.803
9	9	0842	252	36.057	-74.796
9	9	1201	252	36.007	-74.811
9	9	1347	252	35.986	-74.806
9	9	1819	252	35.933	-74.825
9	9	2006	252	35.914	-74.824
9	9	2320	252	35.873	-74.838
10	9	0106	253	35.852	-74.848
10	9	0642	253	35.813	-74.844
10	9	1003	253	35.787	-74.842
10	9	1139	253	35.779	-74.842
10	9	1325	253	35.770	-74.838
10	9	1807	253	35.751	-74.833

Table 6. (cont.)

10	9	1953	253	35.747	-74.823
10	9	2257	253	35.742	-74.817
11	9	0040	254	35.734	-74.806
11	9	0630	254	35.738	-74.786
11	9	0951	254	35.728	-74.762
11	9	1113	254	35.721	-74.749
11	9	1434	254	35.720	-74.726
11	9	1756	254	35.720	-74.715
11	9	1942	254	35.716	-74.706
11	9	2234	254	35.711	-74.715
12	9	0152	255	35.706	-74.721
12	9	0759	255	35.705	-74.743
12	9	0945	255	35.702	-74.755
12	9	1231	255	35.697	-74.766
12	9	1416	255	35.698	-74.773
12	9	1744	255	35.704	-74.797
12	9	2104	255	35.707	-74.793
12	9	2349	255	35.707	-74.805
13	9	0133	256	35.717	-74.801
13	9	0746	256	35.741	-74.806
13	9	0933	256	35.746	-74.807
13	9	1208	256	35.752	-74.812
13	9	1354	256	35.755	-74.811
13	9	1731	256	35.768	-74.825
13	9	2056	256	35.778	-74.829
13	9	2326	256	35.779	-74.836
14	9	0110	257	35.783	-74.841
14	9	0735	257	35.802	-74.858
14	9	0922	257	35.809	-74.862
14	9	1144	257	35.818	-74.864
14	9	1859	257	35.835	-74.875
14	9	2045	257	35.835	-74.875
14	9	2303	257	35.836	-74.880
15	9	0048	258	35.836	-74.879
15	9	0723	258	35.836	-74.879
15	9	0910	258	35.838	-74.878
15	9	1439	258	35.837	-74.876
15	9	1847	258	35.835	-74.883
15	9	2034	258	35.836	-74.877
15	9	2239	258	35.836	-74.881
16	9	0025	259	35.838	-74.871
16	9	0159	259	35.844	-74.880
16	9	0712	259	35.838	-74.878
16	9	0859	259	35.836	-74.879
16	9	1237	259	35.837	-74.881
16	9	1422	259	35.835	-74.878
16	9	1835	259	35.831	-74.883
16	9	2022	259	35.829	-74.881
16	9	2216	259	35.831	-74.879
17	9	0140	260	35.820	-74.884
17	9	0700	260	35.823	-74.881
17	9	0847	260	35.825	-74.881
17	9	1213	260	35.826	-74.883
17	9	1359	260	35.822	-74.879
17	9	1824	260	35.805	-74.874
17	9	2010	260	35.796	-74.865
17	9	2331	260	35.780	-74.870
18	9	0117	261	35.776	-74.864
18	9	0647	261	35.773	-74.859
18	9	0835	261	35.773	-74.851
18	9	1150	261	35.771	-74.840

Table 6. (cont.)

18	9	1336	261	35.771	-74.831
18	9	1812	261	35.772	-74.822
18	9	1958	261	35.775	-74.814
18	9	2309	261	35.775	-74.823
19	9	0054	262	35.776	-74.816
19	9	0635	262	35.763	-74.810
19	9	0956	262	35.746	-74.805
19	9	1126	262	35.737	-74.804
19	9	1445	262	35.709	-74.802
19	9	1801	262	35.687	-74.805
19	9	1947	262	35.672	-74.790
20	9	0024	263	35.619	-74.793
20	9	0623	263	35.571	-74.756
20	9	0950	263	35.562	-74.725
20	9	1243	263	35.557	-74.691
20	9	1427	263	35.557	-74.645
21	9	0141	264	35.798	-74.253
21	9	0752	264	36.054	-74.028
21	9	0938	264	36.139	-73.989
21	9	1219	264	36.252	-73.900
21	9	1405	264	36.319	-73.855
21	9	1736	264	36.434	-73.744
21	9	2057	264	36.520	-73.613
21	9	2338	264	36.589	-73.521
22	9	0123	265	36.630	-73.448
22	9	0740	265	36.762	-73.147
22	9	0926	265	36.790	-73.051
22	9	1156	265	36.818	-72.903
22	9	1342	265	36.833	-72.792
22	9	1904	265	36.867	-72.428
22	9	2049	265	36.873	-72.312
22	9	2315	265	36.887	-72.139
23	9	0100	266	36.895	-72.013
23	9	0728	266	36.980	-71.546
23	9	0914	266	37.013	-71.430
23	9	1132	266	37.053	-71.274
23	9	1318	266	37.092	-71.165
23	9	1852	266	37.217	-70.848
23	9	2039	266	37.259	-70.729
23	9	2251	266	37.316	-70.606
24	9	0037	267	37.359	-70.499
24	9	0715	267	37.520	-70.097
24	9	0903	267	37.567	-70.003
24	9	1108	267	37.615	-69.877
24	9	1701	267	37.765	-69.537
24	9	1847	267	37.794	-69.432
24	9	2026	267	37.823	-69.319
24	9	2229	267	37.855	-69.191
25	9	0014	268	37.870	-69.078
25	9	0844	268	37.976	-68.471
25	9	1044	268	37.999	-68.304
25	9	1409	268	38.081	-68.064
25	9	1828	268	38.172	-67.776
25	9	2015	268	38.203	-67.661
26	9	0124	269	38.283	-67.337
26	9	0652	269	38.292	-67.033
26	9	0839	269	38.280	-66.935
26	9	1201	269	38.250	-66.757
26	9	1346	269	38.233	-66.654
26	9	1816	269	38.149	-66.415
26	9	2003	269	38.102	-66.323



Table 6. (cont.)

26	9	2320	269	38.006	-66.119
27	9	0106	270	37.955	-66.022
27	9	0638	270	37.757	-65.657
27	9	0827	270	37.696	-65.518
27	9	1138	270	37.595	-65.277
27	9	1317	270	37.556	-65.134
27	9	2257	270	37.469	-64.275
28	9	0042	271	37.475	-64.127
28	9	0808	271	37.619	-63.553
28	9	1114	271	37.761	-63.367
28	9	1300	271	37.865	-63.299
28	9	1753	271	38.147	-63.228
28	9	1939	271	38.255	-63.219
28	9	2234	271	38.401	-63.303
29	9	0019	272	38.494	-63.344
29	9	0615	272	38.723	-63.637
29	9	0803	272	38.762	-63.748
29	9	0940	272	38.779	-63.858
29	9	1049	272	38.789	-63.929
29	9	1409	272	38.778	-64.180
29	9	1742	272	38.766	-64.456
29	9	1928	272	38.757	-64.579
29	9	2210	272	38.734	-64.785
29	9	2356	272	38.731	-64.898
30	9	0604	273	38.720	-65.297
30	9	0924	273	38.721	-65.509
30	9	1207	273	38.766	-65.680
30	9	1352	273	38.803	-65.781
30	9	1729	273	38.898	-65.965
30	9	1916	273	38.966	-66.023
30	9	2147	273	39.057	-66.129
1	10	0106	274	39.173	-66.212
1	10	0732	274	39.449	-66.325
1	10	0918	274	39.533	-66.362
1	10	1143	274	39.642	-66.337
1	10	1329	274	39.725	-66.320
1	10	1717	274	39.879	-66.237
1	10	1903	274	39.947	-66.170
1	10	2124	274	40.027	-66.074
1	10	2310	274	40.090	-66.008
2	10	0049	275	40.140	-65.926
2	10	0719	275	40.303	-65.547
2	10	0906	275	40.326	-65.436
2	10	1119	275	40.349	-65.315
2	10	1305	275	40.365	-65.202
2	10	1705	275	40.378	-64.958
2	10	2026	275	40.340	-64.741
2	10	2240	275	40.328	-64.588
3	10	0026	276	40.294	-64.487
3	10	0708	276	40.113	-64.159
3	10	0853	276	40.057	-64.072
3	10	1055	276	39.992	-63.998
3	10	1243	276	39.925	-63.928
3	10	1419	276	39.866	-63.884
3	10	1654	276	39.773	-63.820
3	10	2014	276	39.667	-63.765
3	10	2215	276	39.623	-63.716
4	10	0002	277	39.586	-63.686
4	10	0655	277	39.501	-63.599
4	10	0843	277	39.492	-63.575
4	10	1031	277	39.485	-63.562

Table 6. (cont.)

4	10	1351	277	39.489	-63.537
4	10	1821	277	39.501	-63.519
4	10	2006	277	39.508	-63.494
4	10	2153	277	39.525	-63.499
4	10	2339	277	39.544	-63.480
5	10	0644	278	39.606	-63.482
5	10	0831	278	39.621	-63.486
5	10	1149	278	39.652	-63.500
5	10	1334	278	39.674	-63.499
5	10	1810	278	39.696	-63.516
5	10	1954	278	39.702	-63.514
5	10	2309	278	39.708	-63.557
6	10	0054	279	39.720	-63.565
6	10	0631	279	39.722	-63.577
6	10	0819	279	39.712	-63.586
6	10	1125	279	39.705	-63.620
6	10	1309	279	39.706	-63.635
6	10	1758	279	39.700	-63.655
6	10	1944	279	39.690	-63.661
6	10	2245	279	39.676	-63.690
7	10	0032	280	39.673	-63.707
7	10	0619	280	39.656	-63.713
7	10	0806	280	39.649	-63.719
7	10	1102	280	39.630	-63.747
7	10	1248	280	39.619	-63.753
7	10	1745	280	39.595	-63.786
7	10	1932	280	39.584	-63.788
7	10	2222	280	39.561	-63.808
8	10	0007	281	39.548	-63.820
8	10	0608	281	39.515	-63.860
8	10	0755	281	39.500	-63.863
8	10	0928	281	39.489	-63.866
8	10	1357	281	39.445	-63.907
8	10	1733	281	39.437	-63.925
8	10	1920	281	39.423	-63.922
8	10	2159	281	39.404	-63.923
8	10	2344	281	39.391	-63.926
9	10	0555	282	39.355	-63.966
9	10	0916	282	39.349	-63.971
9	10	1155	282	39.333	-63.976
9	10	1339	282	39.325	-63.978
9	10	1723	282	39.313	-63.998
9	10	1908	282	39.312	-64.002
9	10	2136	282	39.304	-64.008
10	10	0056	283	39.302	-64.005
10	10	0724	283	39.272	-64.044
10	10	0909	283	39.270	-64.058
10	10	1131	283	39.271	-64.089
10	10	1318	283	39.261	-64.083

Table 7.

Positions of Argos drifter 03481 Endeavor 90

SHIP: ENDEAVOR CRUISE: 90 DATES: SEPT 22 - OCT 14, 1982  
 DRIFTER: 3481

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG	
24	9	2021	267	39.825	-64.402
24	9	2228	267	39.828	-64.334
25	9	0014	268	39.827	-64.286
25	9	0843	268	39.753	-64.080
25	9	1403	268	39.723	-64.030
25	9	1649	268	39.727	-63.998
25	9	2009	268	39.727	-63.929
25	9	2344	268	39.709	-63.855
26	9	0651	269	39.667	-63.729
26	9	0838	269	39.658	-63.696
26	9	1200	269	39.639	-63.628
26	9	1345	269	39.632	-63.589
26	9	1636	269	39.623	-63.517
26	9	1822	269	39.612	-63.498
26	9	2003	269	39.604	-63.449
27	9	0100	270	39.550	-63.314
27	9	0639	270	39.501	-63.192
27	9	0826	270	39.489	-63.149
27	9	1137	270	39.476	-63.089
27	9	1316	270	39.475	-63.036
27	9	1625	270	39.463	-62.935
27	9	1945	270	39.425	-62.836
27	9	2257	270	39.397	-62.747
28	9	0041	271	39.383	-62.711
28	9	0626	271	39.368	-62.558
28	9	0914	271	39.368	-62.501
28	9	1113	271	39.357	-62.389
28	9	1259	271	39.344	-62.306
28	9	1753	271	39.296	-62.131
28	9	1939	271	39.275	-62.070
28	9	2234	271	39.248	-61.972
29	9	0020	272	39.230	-61.906
29	9	0614	272	39.159	-61.675
29	9	0802	272	39.126	-61.590
29	9	1050	272	39.068	-61.489
29	9	1234	272	39.034	-61.417
29	9	1741	272	38.926	-61.252
29	9	1927	272	38.888	-61.191
29	9	2209	272	38.828	-61.101
29	9	2355	272	38.791	-61.046
30	9	0603	273	38.655	-60.843
30	9	0747	273	38.620	-60.783

Table 8.

Positions of Argos drifter 03480 Endeavor 90

SHIP: ENDEAVOR CRUISE: 90 DATES: SEPT 22 - OCT 14, 1982  
 DRIFTER: 3480

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG
5 10	1810	278	39.509	-65.099
5 10	1956	278	39.495	-65.105
5 10	2309	278	39.469	-65.133
6 10	0055	279	39.460	-65.148
6 10	0632	279	39.419	-65.198
6 10	0819	279	39.407	-65.212
6 10	0955	279	39.406	-65.226
6 10	1125	279	39.389	-65.240
6 10	1312	279	39.376	-65.252
6 10	1758	279	39.342	-65.315
6 10	1943	279	39.336	-65.328
6 10	2246	279	39.322	-65.369
7 10	0032	280	39.315	-65.386
7 10	0620	280	39.287	-65.444
7 10	0806	280	39.273	-65.457
7 10	0944	280	39.259	-65.476
7 10	1101	280	39.254	-65.486
7 10	1248	280	39.240	-65.502
7 10	1745	280	39.216	-65.577
7 10	1933	280	39.215	-65.596
7 10	2222	280	39.203	-65.635
8 10	0008	281	39.201	-65.657
8 10	0607	281	39.198	-65.729
8 10	0928	281	39.203	-65.765
8 10	1038	281	39.208	-65.779
8 10	1357	281	39.211	-65.806
8 10	1734	281	39.217	-65.842
8 10	1920	281	39.222	-65.852
8 10	2159	281	39.230	-65.873
8 10	2344	281	39.236	-65.869
9 10	0556	282	39.235	-65.893
9 10	0916	282	39.241	-65.906
9 10	1155	282	39.235	-65.907
9 10	1339	282	39.236	-65.904
9 10	1721	282	39.245	-65.918
9 10	1909	282	39.256	-65.912
9 10	2047	282	39.257	-65.916
9 10	2136	282	39.261	-65.912
10 10	0100	283	39.257	-65.888
10 10	0725	283	39.230	-65.903
10 10	0908	283	39.210	-65.901
10 10	1131	283	39.202	-65.944
10 10	1317	283	39.206	-65.945
10 10	1709	283	39.207	-65.979
10 10	2030	283	39.197	-66.003
10 10	2251	283	39.183	-65.995
11 10	0038	284	39.170	-66.007
11 10	0714	284	39.124	-66.052
11 10	0859	284	39.117	-66.068
11 10	1108	284	39.123	-66.087
11 10	1254	284	39.126	-66.110
11 10	1659	284	39.106	-66.134
11 10	2018	284	39.100	-66.160
11 10	2227	284	39.101	-66.175
12 10	0012	285	39.104	-66.187



Table 8. (cont.)

12	10	0700	285	39.108	-66.250
12	10	0847	285	39.111	-66.271
12	10	1404	285	39.121	-66.296
12	10	1647	285	39.145	-66.309
12	10	1832	285	39.128	-66.300
12	10	2011	285	39.126	-66.289
12	10	2205	285	39.121	-66.285
12	10	2350	285	39.114	-66.292
13	10	0648	286	39.127	-66.348
13	10	0835	286	39.132	-66.344
13	10	1201	286	39.136	-66.340
13	10	1344	286	39.134	-66.333
13	10	1813	286	39.138	-66.330
13	10	2000	286	39.135	-66.315
13	10	2320	286	39.129	-66.322
14	10	0106	287	39.128	-66.321
14	10	0636	287	39.140	-66.316
14	10	0817	287	39.147	-66.312
14	10	0957	287	39.155	-66.299

Table 9.

Positions of Argos drifter 03481 Endeavor 90SHIP: ENDEAVOR CRUISE: 90 DATES: SEPT 22 - OCT 14, 1982  
DRIFTER: 3481

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG
5 10	1149	278	39.123	-64.830
5 10	1334	278	39.106	-64.876
5 10	1809	278	39.056	-65.006
5 10	1956	278	39.041	-65.056
5 10	2309	278	39.009	-65.170
6 10	0055	279	39.000	-65.224
6 10	0631	279	38.973	-65.407
6 10	0820	279	38.968	-65.466
6 10	1126	279	38.972	-65.553
6 10	1312	279	38.967	-65.602
6 10	1758	279	38.955	-65.745
6 10	1944	279	38.955	-65.793
6 10	2244	279	38.964	-65.900
7 10	0032	280	38.980	-65.943
7 10	0620	280	39.024	-66.076
7 10	0808	280	39.040	-66.106
7 10	0944	280	39.051	-66.133
7 10	1102	280	39.056	-66.153
7 10	1248	280	39.064	-66.178
7 10	1745	280	39.099	-66.279
7 10	1932	280	39.121	-66.301
7 10	2222	280	39.154	-66.341
8 10	0006	281	39.177	-66.347
8 10	0607	281	39.247	-66.375
8 10	0928	281	39.279	-66.387
8 10	1038	281	39.289	-66.386
8 10	1403	281	39.312	-66.393
8 10	1733	281	39.352	-66.403
8 10	1920	281	39.367	-66.388
8 10	2159	281	39.387	-66.383
9 10	0555	282	39.430	-66.323
9 10	0922	282	39.448	-66.309
9 10	1155	282	39.455	-66.289
9 10	1340	282	39.464	-66.269
9 10	1722	282	39.487	-66.234
9 10	1906	282	39.498	-66.210
9 10	2315	282	39.509	-66.180
10 10	0100	283	39.519	-66.152
10 10	0724	283	39.498	-66.091
10 10	0909	283	39.486	-66.082
10 10	1131	283	39.474	-66.093
10 10	1316	283	39.477	-66.083
10 10	1710	283	39.494	-66.067
10 10	2030	283	39.455	-66.031
10 10	2252	283	39.448	-66.011
11 10	0037	284	39.433	-65.994
11 10	0713	284	39.359	-65.962
11 10	0859	284	39.335	-65.954
11 10	1107	284	39.321	-65.969
11 10	1254	284	39.315	-65.949
11 10	1430	284	39.306	-65.943
11 10	1659	284	39.310	-65.963
11 10	2019	284	39.265	-65.929
11 10	2227	284	39.237	-65.935
12 10	0014	285	39.222	-65.939

Table 9. (cont.)

12	10	0700	285	39.165	-65.983
12	10	0847	285	39.149	-65.981
12	10	1044	285	39.143	-65.993
12	10	1403	285	39.110	-66.006
12	10	1826	285	39.075	-66.040
12	10	2012	285	39.062	-66.038
12	10	2205	285	39.041	-66.050
12	10	2351	285	39.024	-66.071
13	10	0125	286	39.006	-66.092
13	10	0648	286	38.972	-66.149
13	10	0835	286	38.966	-66.163
13	10	1201	286	38.962	-66.183
13	10	1346	286	38.956	-66.189
13	10	1814	286	38.940	-66.218
13	10	2001	286	38.937	-66.227
13	10	2142	286	38.926	-66.239
14	10	0105	287	38.923	-66.259
14	10	0637	287	38.948	-66.298
14	10	0817	287	38.953	-66.306
14	10	1137	287	38.968	-66.321
14	10	1320	287	38.974	-66.318
14	10	1802	287	39.002	-66.343
14	10	1948	287	39.016	-66.329
14	10	2257	287	39.038	-66.318
15	10	0042	288	39.041	-66.308
15	10	0624	288	39.034	-66.307
15	10	0811	288	39.035	-66.305
15	10	1113	288	39.051	-66.305
15	10	1301	288	39.055	-66.302
15	10	1750	288	39.085	-66.284
15	10	1937	288	39.091	-66.263
15	10	2234	288	39.090	-66.234
16	10	0019	289	39.088	-66.212
16	10	0612	289	39.066	-66.182
16	10	0800	289	39.062	-66.169
16	10	0933	289	39.057	-66.170
16	10	1050	289	39.057	-66.153
16	10	1409	289	39.052	-66.107
16	10	1739	289	39.029	-66.050
16	10	1926	289	39.002	-66.019
16	10	2210	289	38.953	-65.982
16	10	2357	289	38.925	-65.983
17	10	0600	290	38.853	-65.973
17	10	0922	290	38.806	-65.936
17	10	1207	290	38.765	-65.917
17	10	1352	290	38.731	-65.890
17	10	1726	290	38.655	-65.870
17	10	1913	290	38.616	-65.864
17	10	2147	290	38.567	-65.861
18	10	0106	291	38.496	-65.879
18	10	0548	291	38.404	-65.863
18	10	0914	291	38.355	-65.852
18	10	1143	291	38.297	-65.843
18	10	1329	291	38.252	-65.837
18	10	1714	291	38.171	-65.842
18	10	1901	291	38.134	-65.838
18	10	2303	291	38.066	-65.876
19	10	0049	292	38.039	-65.872
19	10	0717	292	37.917	-65.836
19	10	0904	292	37.878	-65.816
19	10	1121	292	37.817	-65.809
19	10	1306	292	37.768	-65.799
19	10	1703	292	37.675	-65.802
19	10	2023	292	37.602	-65.802
19	10	2240	292	37.556	-65.776

Table 10.

Positions of Argos drifter 03482 Endeavor 90SHIP: ENDEAVOR CRUISE: 90 DATES: SEPT 22 - OCT 14, 1982  
DRIFTER: 3482

DATE DAY MOS	TIME GMT	YEAR DAY	LATITUDE DEG	LONGITUDE DEG
5 10	2130	278	39.333	-65.227
5 10	2314	278	39.316	-65.274
6 10	0054	279	39.309	-65.300
6 10	0632	279	39.299	-65.421
6 10	0820	279	39.300	-65.457
6 10	1125	279	39.298	-65.508
6 10	1312	279	39.292	-65.536
6 10	1757	279	39.291	-65.627
6 10	1944	279	39.299	-65.652
6 10	2245	279	39.298	-65.701
7 10	0031	280	39.302	-65.731
7 10	0619	280	39.346	-65.806
7 10	0807	280	39.357	-65.811
7 10	0945	280	39.362	-65.823
7 10	1101	280	39.364	-65.828
7 10	1249	280	39.367	-65.836
7 10	1745	280	39.398	-65.875
7 10	1932	280	39.407	-65.870
7 10	2222	280	39.417	-65.885
8 10	0008	281	39.432	-65.883
8 10	0607	281	39.481	-65.855
8 10	0927	281	39.499	-65.833
8 10	1038	281	39.504	-65.820
8 10	1403	281	39.514	-65.790
8 10	1734	281	39.525	-65.760
8 10	1921	281	39.530	-65.733
8 10	2339	281	39.552	-65.668
9 10	0119	282	39.551	-65.638
9 10	0555	282	39.521	-65.536
9 10	0916	282	39.507	-65.490
9 10	1155	282	39.483	-65.450
9 10	1338	282	39.469	-65.414
9 10	1722	282	39.433	-65.372
9 10	1908	282	39.414	-65.344
9 10	2135	282	39.383	-65.308
10 10	0100	283	39.337	-65.256
10 10	0723	283	39.205	-65.252
10 10	0910	283	39.162	-65.266
10 10	1132	283	39.104	-65.322
10 10	1317	283	39.075	-65.348
10 10	1710	283	39.020	-65.424
10 10	2031	283	38.970	-65.489
10 10	2251	283	38.931	-65.519
11 10	0037	284	38.898	-65.552
11 10	0713	284	38.778	-65.757
11 10	0859	284	38.753	-65.815
11 10	1108	284	38.739	-65.894
11 10	1254	284	38.728	-65.949
11 10	1657	284	38.714	-66.083
11 10	2019	284	38.725	-66.187
11 10	2227	284	38.729	-66.253
12 10	0014	285	38.736	-66.297
12 10	0701	285	38.794	-66.487
12 10	0847	285	38.822	-66.535
12 10	1044	285	38.868	-66.583



Table 10. (cont.)

12	10	1403	285	38.916	-66.663
12	10	1826	285	39.002	-66.746
12	10	2013	285	39.048	-66.751
12	10	2204	285	39.071	-66.773
12	10	2351	285	39.106	-66.780
13	10	0125	286	39.142	-66.803
13	10	0648	286	39.244	-66.856
13	10	0835	286	39.280	-66.876
13	10	1201	286	39.362	-66.877
13	10	1346	286	39.405	-66.868
13	10	1814	286	39.485	-66.852
13	10	2001	286	39.510	-66.831
13	10	2142	286	39.525	-66.811
14	10	0106	287	39.572	-66.782
14	10	0636	287	39.636	-66.693
14	10	0817	287	39.651	-66.662
14	10	1137	287	39.675	-66.582
14	10	1322	287	39.678	-66.535
14	10	1802	287	39.678	-66.428
14	10	1949	287	39.672	-66.368
14	10	2258	287	39.639	-66.261
15	10	0043	288	39.608	-66.204
15	10	0625	288	39.481	-66.058
15	10	0812	288	39.445	-66.017
15	10	0947	288	39.421	-65.971
15	10	1113	288	39.383	-65.964
15	10	1301	288	39.347	-65.911
15	10	1748	288	39.238	-65.792
15	10	1935	288	39.190	-65.744
15	10	2234	288	39.096	-65.679
16	10	0020	289	39.033	-65.667
16	10	0612	289	38.848	-65.626
16	10	0759	289	38.795	-65.603
16	10	0933	289	38.754	-65.590
16	10	1050	289	38.711	-65.584
16	10	1409	289	38.593	-65.549
16	10	1737	289	38.476	-65.530
16	10	1924	289	38.408	-65.527
16	10	2210	289	38.304	-65.520
16	10	2355	289	38.238	-65.527
17	10	0601	290	38.001	-65.555
17	10	0922	290	37.878	-65.545
17	10	1207	290	37.772	-65.565
17	10	1352	290	37.690	-65.547
17	10	1726	290	37.539	-65.537
17	10	1912	290	37.457	-65.544
17	10	2147	290	37.348	-65.555
18	10	0105	291	37.215	-65.594
18	10	0730	291	37.021	-65.569
18	10	0915	291	36.958	-65.534
18	10	1144	291	36.873	-65.515
18	10	1328	291	36.813	-65.492
18	10	1714	291	36.712	-65.473
18	10	1901	291	36.672	-65.457
18	10	2035	291	36.635	-65.471
18	10	2303	291	36.602	-65.441
19	10	0048	292	36.569	-65.421
19	10	0718	292	36.455	-65.328
19	10	0903	292	36.425	-65.306
19	10	1120	292	36.386	-65.289
19	10	1306	292	36.356	-65.274
19	10	1701	292	36.317	-65.249
19	10	2023	292	36.285	-65.223
19	10	2239	292	36.257	-65.196

Table 11.

Positions of Argos drifter 03480 USNS Bartlett 40-b

SHIP: BARTLETT CRUISE: 40-B DATES: JANUARY 8 - 24, 1983  
DRIFTER: 3480

DATE	TIME	YEAR	DAY	LATITUDE	LONGITUDE
DAY	MOS			DEG	DEG
11	1	0710	11	40.521	-65.839
11	1	0855	11	40.517	-65.839
11	1	1137	11	40.515	-65.845
11	1	1322	11	40.503	-65.852
11	1	1656	11	40.491	-65.869
11	1	2023	11	40.509	-65.868
11	1	2258	11	40.514	-65.856
12	1	0043	12	40.501	-65.840
12	1	0658	12	40.432	-65.854
12	1	0843	12	40.420	-65.861
12	1	1113	12	40.413	-65.879
12	1	1300	12	40.404	-65.882
12	1	1436	12	40.403	-65.895
12	1	1644	12	40.379	-65.886
12	1	1830	12	40.367	-65.902
12	1	2010	12	40.354	-65.915
12	1	2234	12	40.326	-65.955
13	1	0020	13	40.324	-65.972
13	1	0645	13	40.302	-66.064
13	1	0834	13	40.290	-66.086
13	1	1009	13	40.282	-66.136
13	1	1049	13	40.290	-66.119
13	1	1409	13	40.298	-66.154
13	1	1812	13	40.310	-66.191
13	1	1959	13	40.319	-66.196
13	1	2211	13	40.334	-66.225

Table 12.

A Gregorian to year day calendar conversion

Dcy	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Day
1	001	032	060	091	121	152	182	213	244	274	305	335	1
2	002	033	061	092	122	153	183	214	245	275	306	336	2
3	003	034	062	093	123	154	184	215	246	276	307	337	3
4	004	035	063	094	124	155	185	216	247	277	308	338	4
5	005	036	064	095	125	156	186	217	248	278	309	339	5
6	006	037	065	096	126	157	187	218	249	279	310	340	6
7	007	038	066	097	127	158	188	219	250	280	311	341	7
8	008	039	067	098	128	159	189	220	251	281	312	342	8
9	009	040	068	099	129	160	190	221	252	282	313	343	9
10	010	041	069	100	130	161	191	222	253	283	314	344	10
11	011	042	070	101	131	162	192	223	254	284	315	345	11
12	012	043	071	102	132	163	193	224	255	285	316	346	12
13	013	044	072	103	133	164	194	225	256	286	317	347	13
14	014	045	073	104	134	165	195	226	257	287	318	348	14
15	015	046	074	105	135	166	196	227	258	288	319	349	15
16	016	047	075	106	136	167	197	228	259	289	320	350	16
17	017	048	076	107	137	168	198	229	260	290	321	351	17
18	018	049	077	108	138	169	199	230	261	291	322	352	18
19	019	050	078	109	139	170	200	231	262	292	323	353	19
20	020	051	079	110	140	171	201	232	263	293	324	354	20
21	021	052	080	111	141	172	202	233	264	294	325	355	21
22	022	053	081	112	142	173	203	234	265	295	326	356	22
23	023	054	082	113	143	174	204	235	266	296	327	357	23
24	024	055	083	114	144	175	205	236	267	297	328	358	24
25	025	056	084	115	145	176	206	237	268	298	329	359	25
26	026	057	085	116	146	177	207	238	269	299	330	360	26
27	027	058	086	117	147	178	208	239	270	300	331	361	27
28	028	059	087	118	148	179	209	240	271	301	332	362	28
29	029		088	119	149	180	210	241	272	302	333	363	29
30	030		089	120	150	181	211	242	273	303	334	364	30
31	031		090		151		212	243		304		365	31



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