Northwest Atlantic Fisheries Organization

Serial No. N199 NAFO SCR Doc. 80/IX/127

ANNUAL MEETING OF SCIENTIFIC COUNCIL - SEPTEMBER 1980

The Drift of Satellite-tracked Buoys on Flemish Cap, 1979-80

by

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INTRODUCTION

In conjunction with the program of the NAFO Flemish Cap Experiment a set of six satellite-tracked drifting buoys were released on Flemish Cap between January, 1979, and May, 1980. The position of each buoy is monitored by Service Argos in Toulousse, France. From January to July, 1979, only one satellite was in operation which gave about five position fixes each day. A second satellite became operational in July, 1979, resulting in approximately 10 position fixes each day. The data from these buoys, while they were on Flemish Cap, is given in this report, The start and end times of the position data presented are given in Table 1.

THE DATA

The Buoys

The buoys were manufactured by Hermes Electronics, Dartmouth, Nova Scotia, and are very similar to those used during the First GARP Global Experiment (FGGE) in the Southern Ocean. The buoy is equipped with a large "window-shade" drogue extending from a depth of two to ten meters. The buoy also sensed water temperature which was communicated via the satellite.

Processing

The data received from Service Argos were checked for obvious errors and the arithmetic means of all positions and temperatures were calculated over twelve hour intervals. These data form the primary time series for each buoy.

Positions

The twelve-hourly positions obtained while on Flemish Cap are plotted in figure 1a-1f. The 140, 400 and 1000m isobaths are shown in figures to orient the drift tracks to the bottom bathymetry.

Velocity and Temperature

The twelve-hourly values of position were differenced over 24 hours to form the time series of buoy velocities shown in figures 2a-2f. The temperature time series sensed by each buoy is given in figure 3.

Wind Velocity

The synoptic meteorological charts of sea surface barometric pressure produced by the Canadian Atmospheric Environment Service were used to create a time series of geostrophic wind on Flemish Cap. The geostrophic winds were computed at six hour intervals and averaged over 24 hours. The time series of wind velocity is given in figure 4 and the progressive vector diagram is given in figure 5.

DISCUSSION

Figure 1 shows the tracks of the six buoys released. Most buoys experienced a very slow motion while on the Cap with a general trend toward an anticyclonic rotation. However, the path of each buoy is unique. Buoy 2422 managed to get to the northwest slope of the Cap and then proceeded in a very regular track around the outer limits of the Cap. This could quite possibly show the outer branch of the Labrador Current mentioned previously in the literature. Buoy 2428 had the most unexpected track. Initially it proceeded to the west and came under the influence of the Labrador Current that carried it well south. It then headed east before being returned across the southwestern part of Flemish Cap. The other buoys described slow, anticyclonic motions over the interior of the Cap. All buoys finally exitted near the southeastern sector of the Cap where they encountered the warm North Atlantic Current and were advected out of the region.

Figure 2 shows the mean daily velocity of each buoy for a period well beyond the time when they left the Cap. In all cases the speeds are very low compared to those encountered after leaving the Cap.

The temperatures shown in figure 3 indicate a relatively constant low value while the buoy is on the Cap followed by a sharp rise when the buoy enters the North Atlantic Current. This is less true for the buoys (2428, 2433) on Flemish Cap after summer heating of the surface layer has blurred the contrast with the North Atlantic Current.

It is not readily apparent that there is a close connection between geostrophic wind (figure 4, 5) and buoy displacements. It appears that the buoy's location on the Cap is very critical to what effect the wind direction will have. Any given wind direction will tend to push the buoy onto or off the Cap depending on whether the buoy is on the windward or leeward side. Buoys 2421 and 2426 were both in the interior of the circulation around the Cap when they were simultaneously ejected to the southeast. It also appears that wind is not required to eject the buoys once they approach the southeastern flank of the Cap. The intense mixing with the North Atlantic Current is adequate to trap the buoys and very quickly advect them out of the area.

TABLE 1

Buoy	Start Time (day, year)	End Time (day)	Time On Flemish Cap (days)
2421	14, 1979	54	41
2422	77, 1979	148	72
2425	88, 1979	131	44
2426	27, 1979	58	32
2428	189, 1979	250	62
2433	144, 1980	194	51
		Average	50

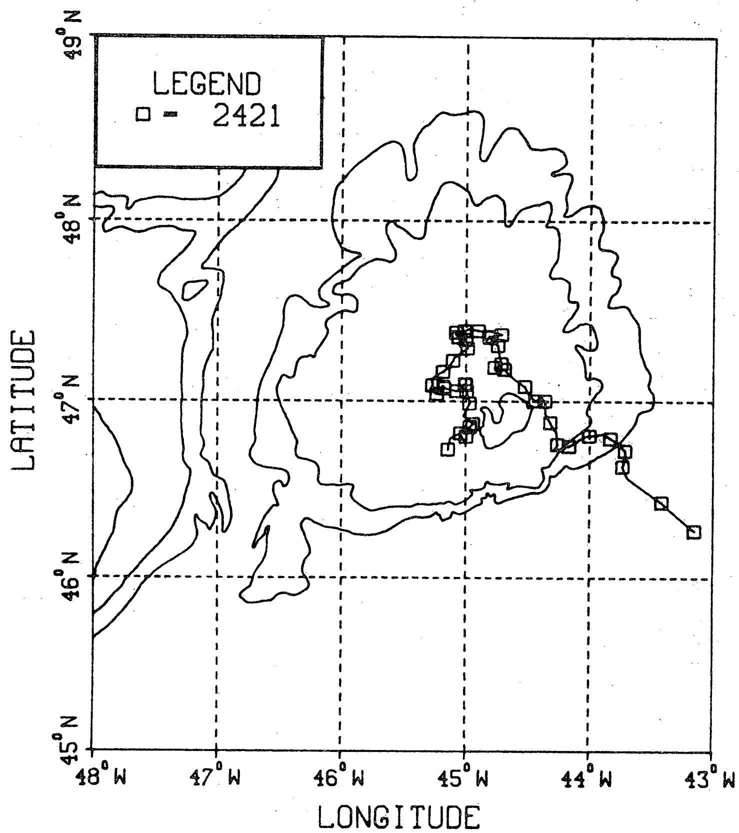


Fig. 1a. Drift track of buoy 2421. First point at 46.72N, 45.16W at 1800z day 14. Last point at 1800z day 54. Symbol every 24 hours.

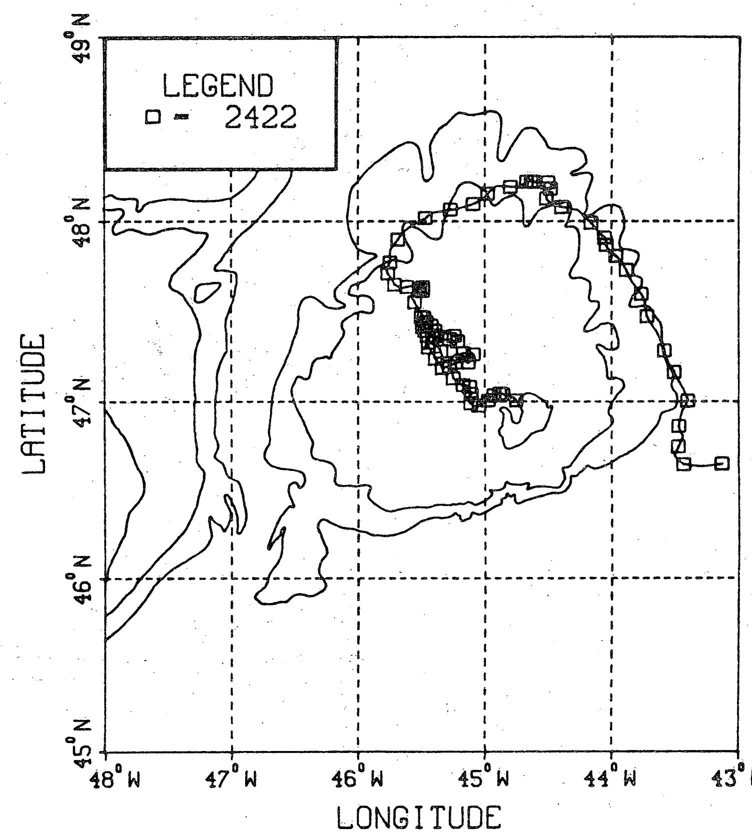


Fig. 1b. Drift track of buoy 2422. First point at 46.99 N, 44.50W at 1800z day 77. Last point at 0600z day 148. Symbol every 24 hours.

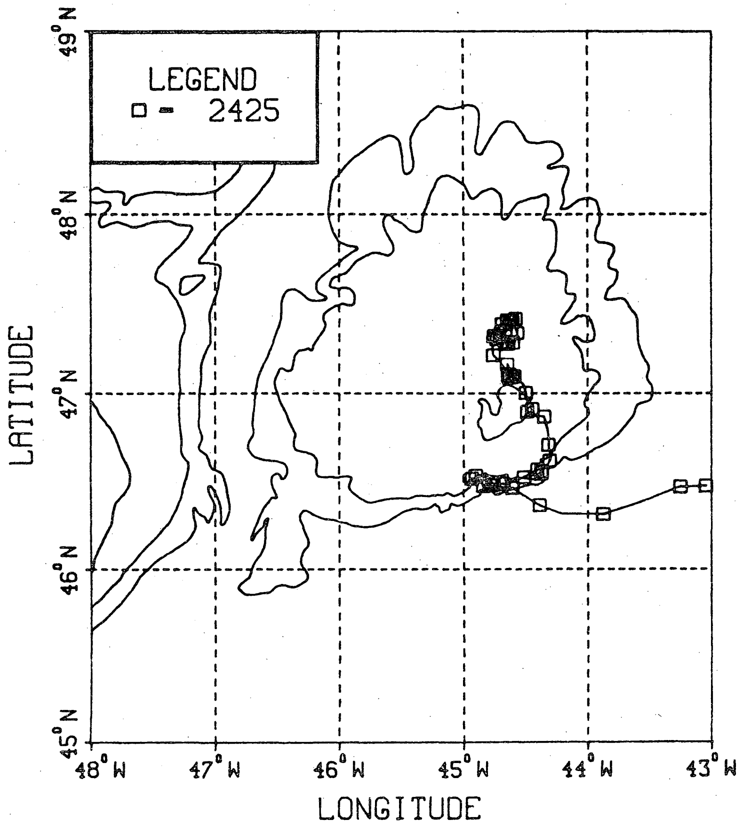


Fig. 1c. Drift Track of buoy 2425. First point at 47.31N, 44.83W at 0600z day 88. Last point at 1800z day 131. Symbol every 24 hours.

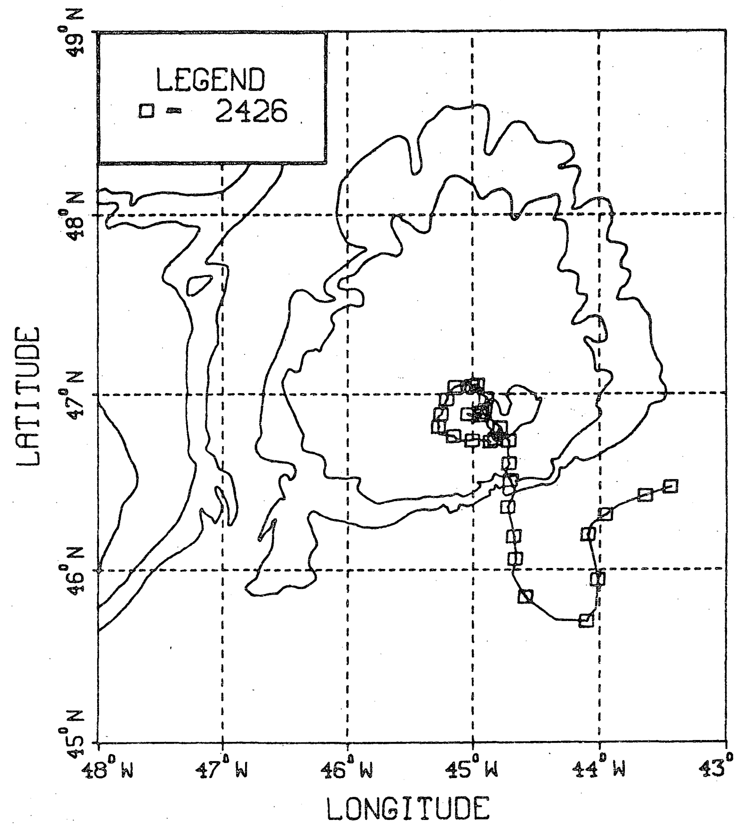


Fig. 1d. Drift track of buoy 2426. First point at 46.84N, 44.45W at 1800z day 27. Last point at 1800z day 58. Symbol every 24 hours.

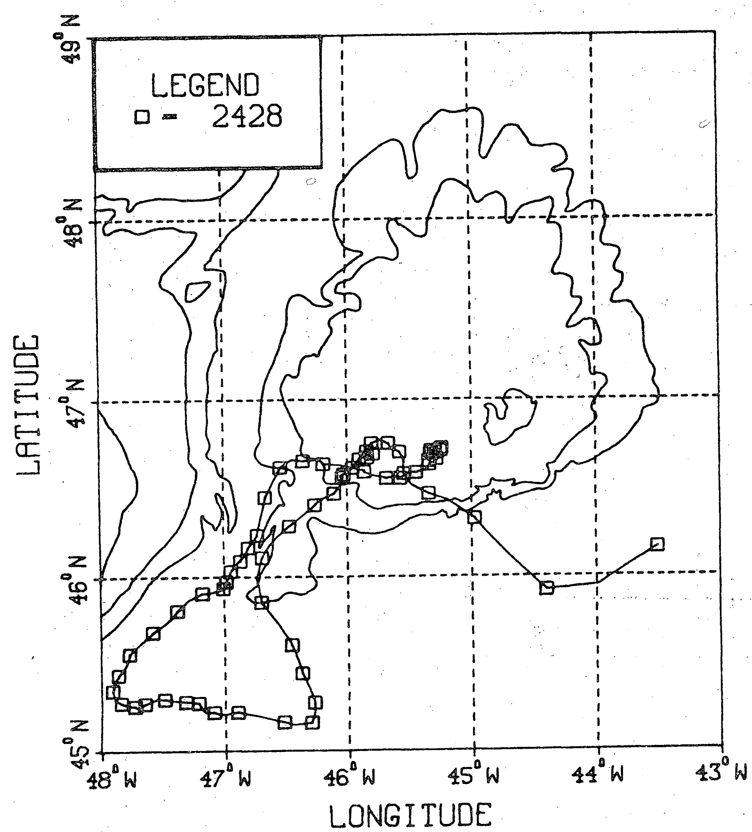


Fig. 1e. Drift track for buoy 2428. First point at 46.69N, 45.19W at 0800z day 189. Last point at 0800z day 250. Symbol every 24 hours.

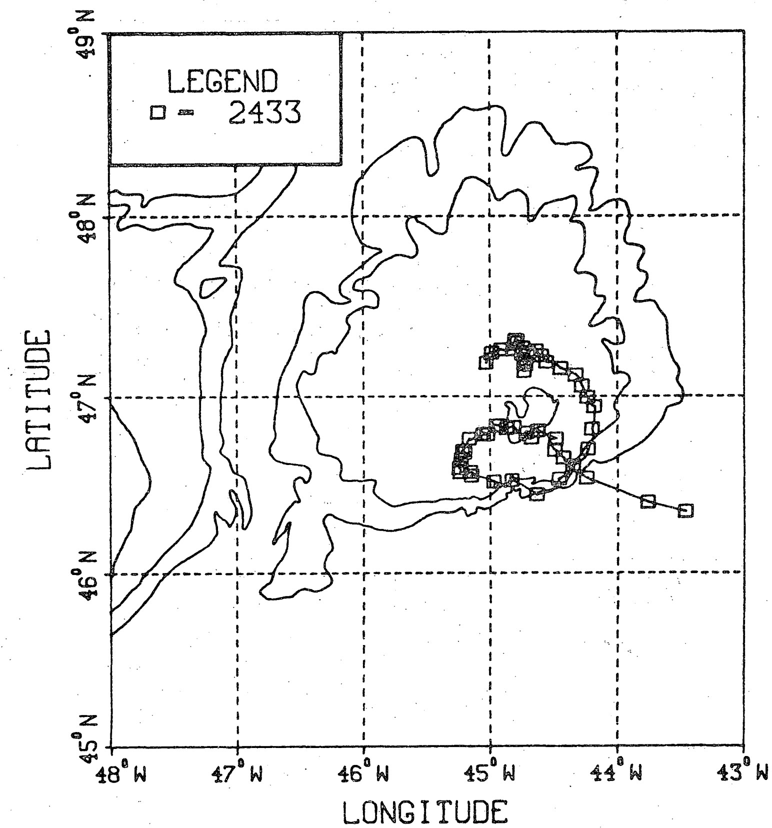


Fig. 1f. Drift track of buoy 2433. First point at 47.19N, 45.03W at 0800z day 144 (1980). Last point at 2000z day 194. Symbol every 24 hours.

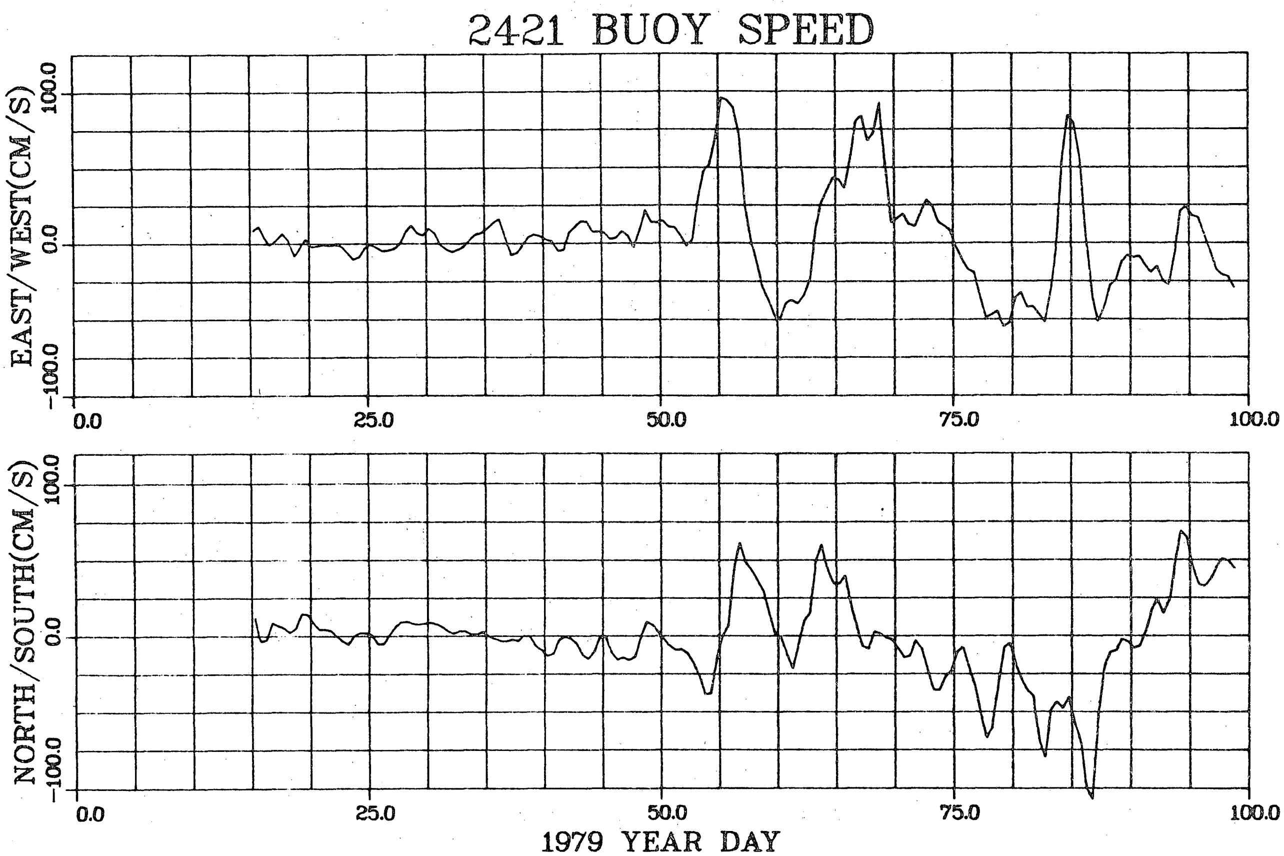


Figure 2a: Components of velocity for buoy 2421. Positive components are to the east and to the north. Values are daily average.

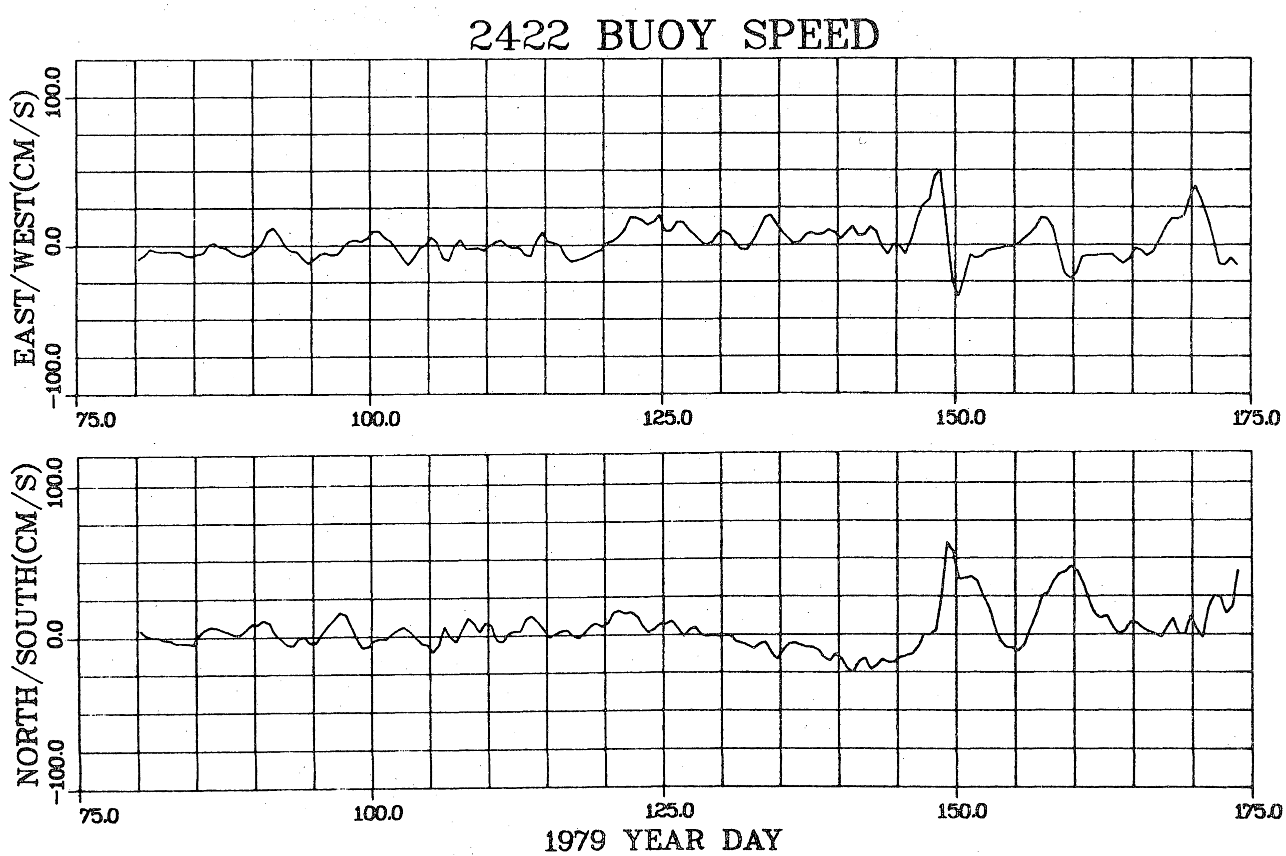


Figure 2b: Components of velocity for buoy 2422.

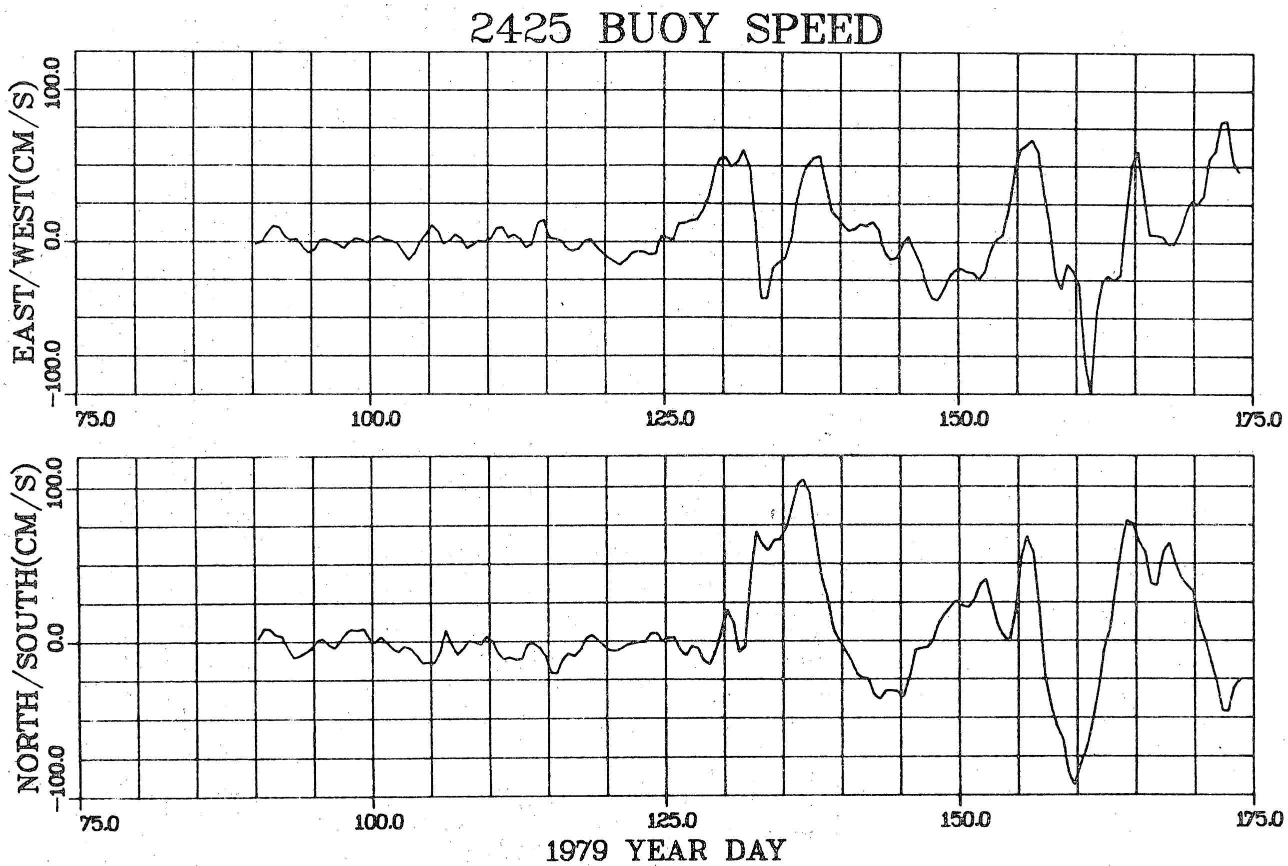


Figure 2c: Components of velocity for buoy 2425.

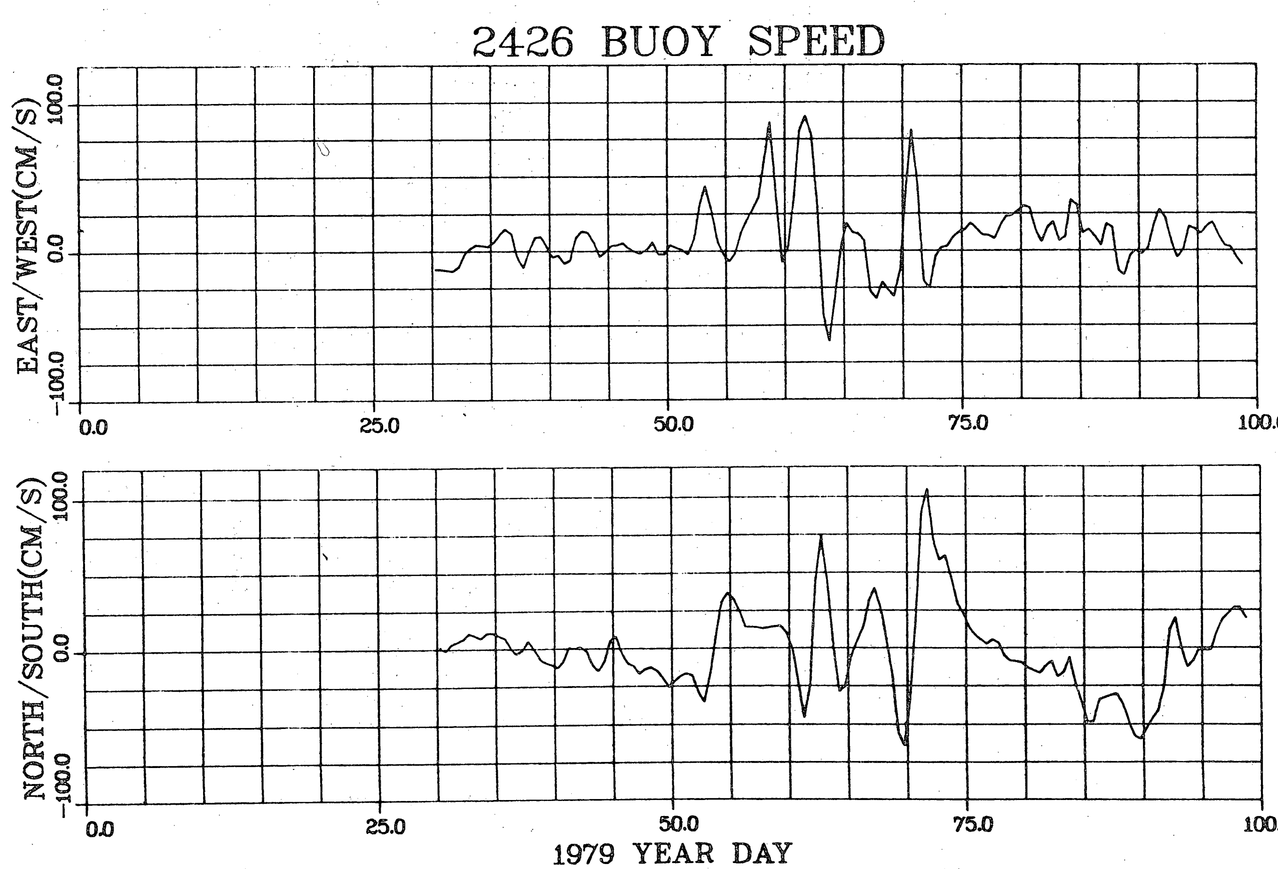


Figure 2d: Components of velocity for buoy 2426.

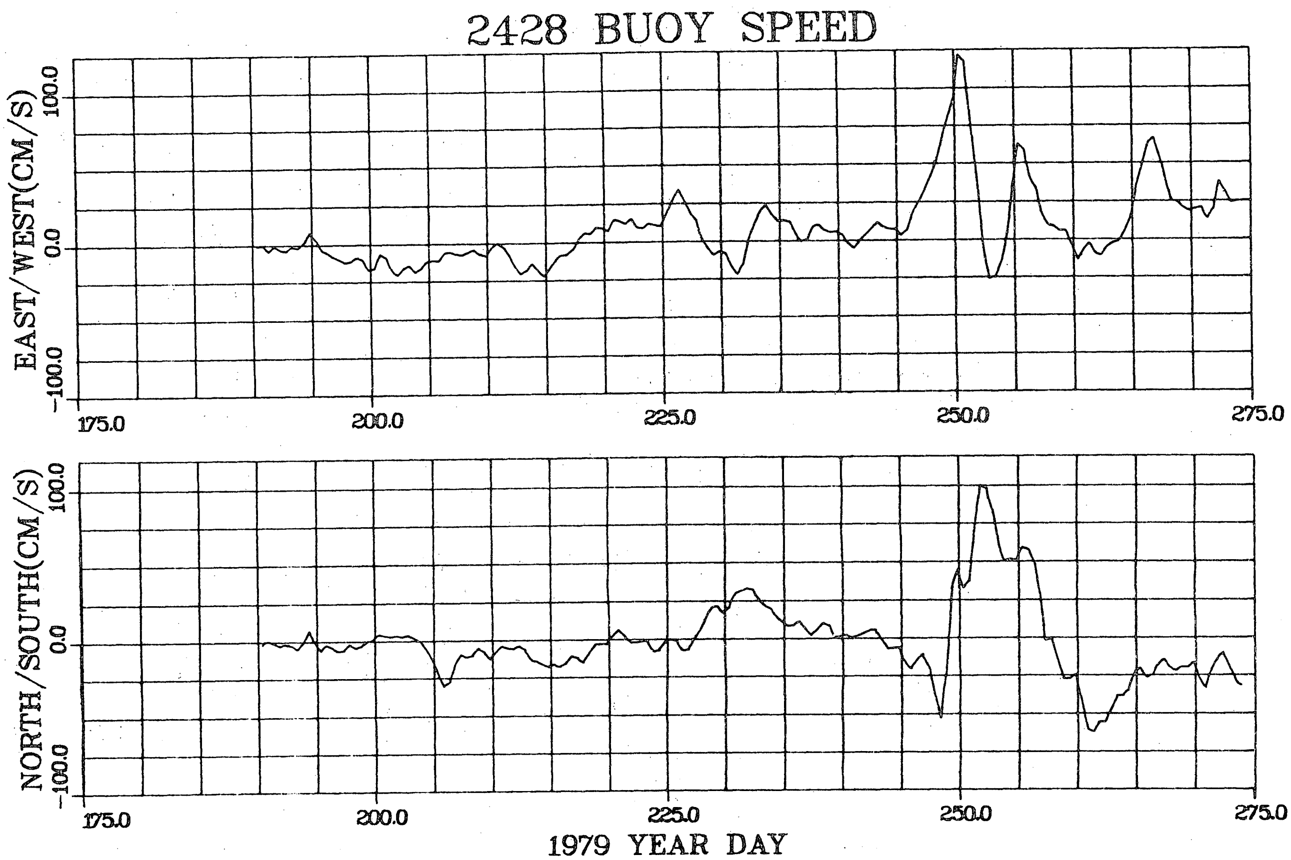


Figure 2e: Components of velocity for buoy 2428.

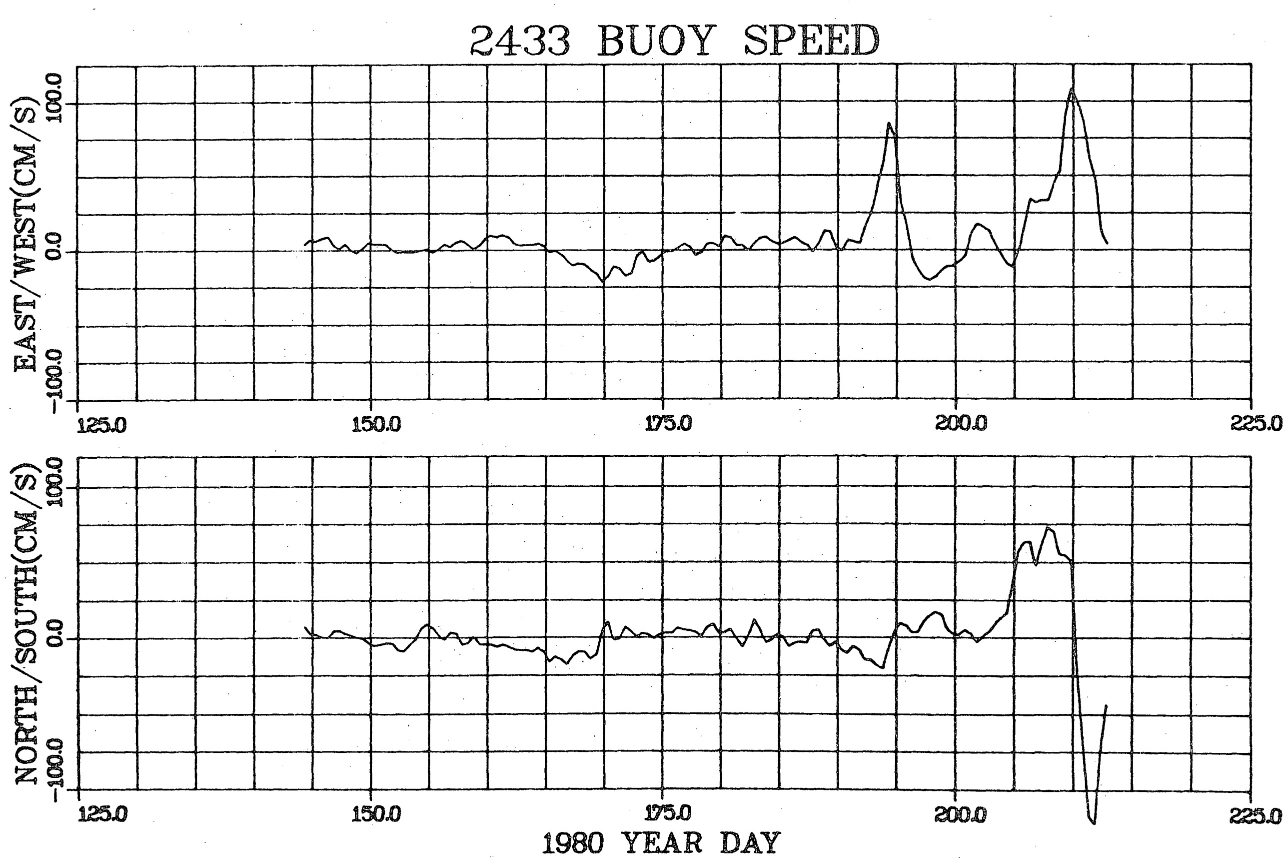
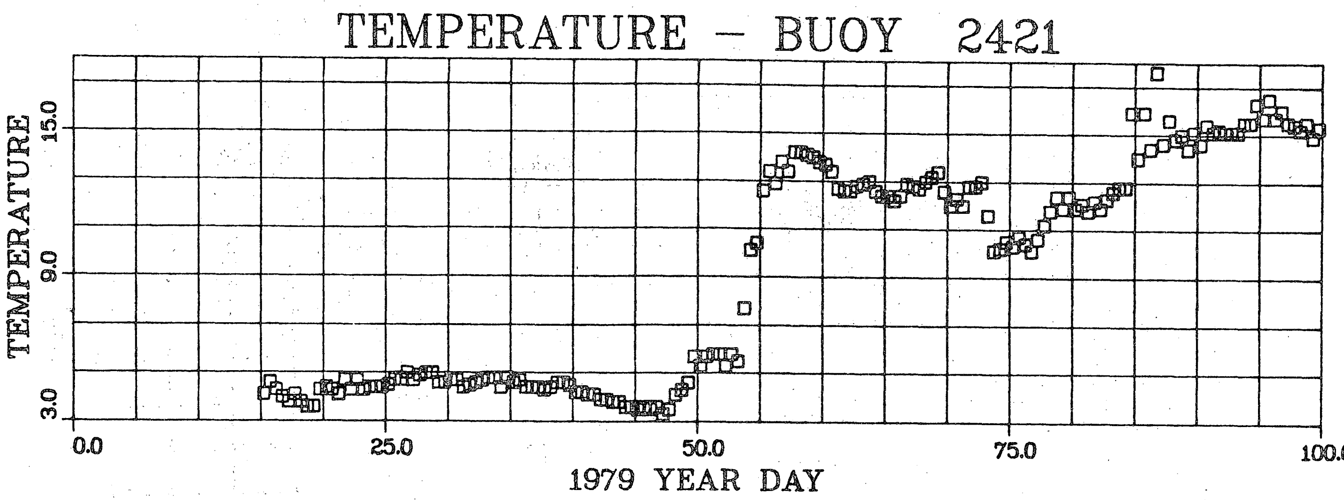
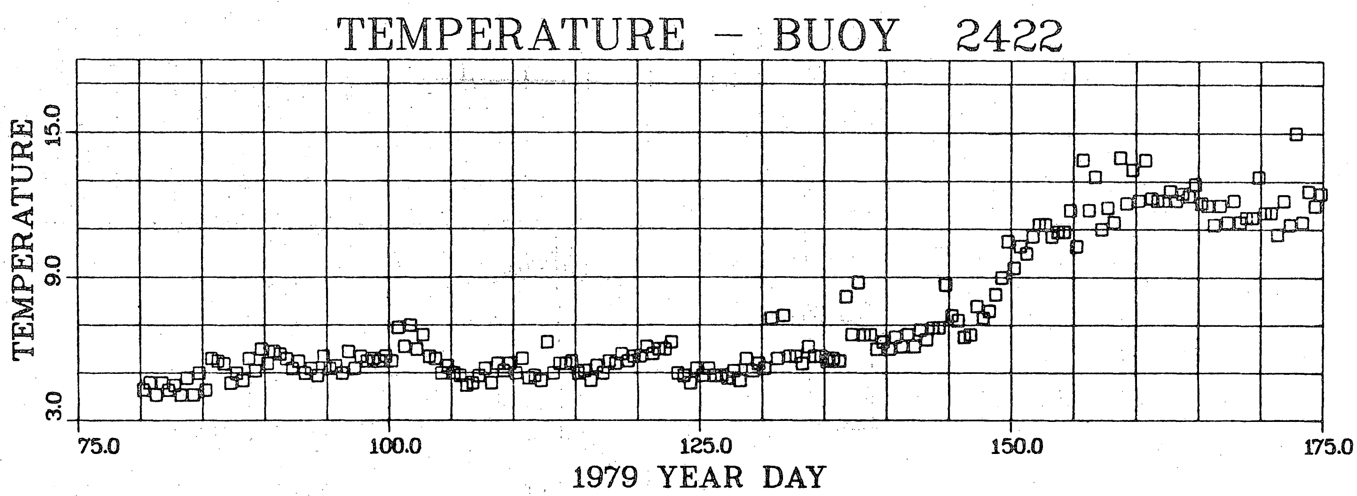


Figure 2f: Components of velocity for buoy 2433.





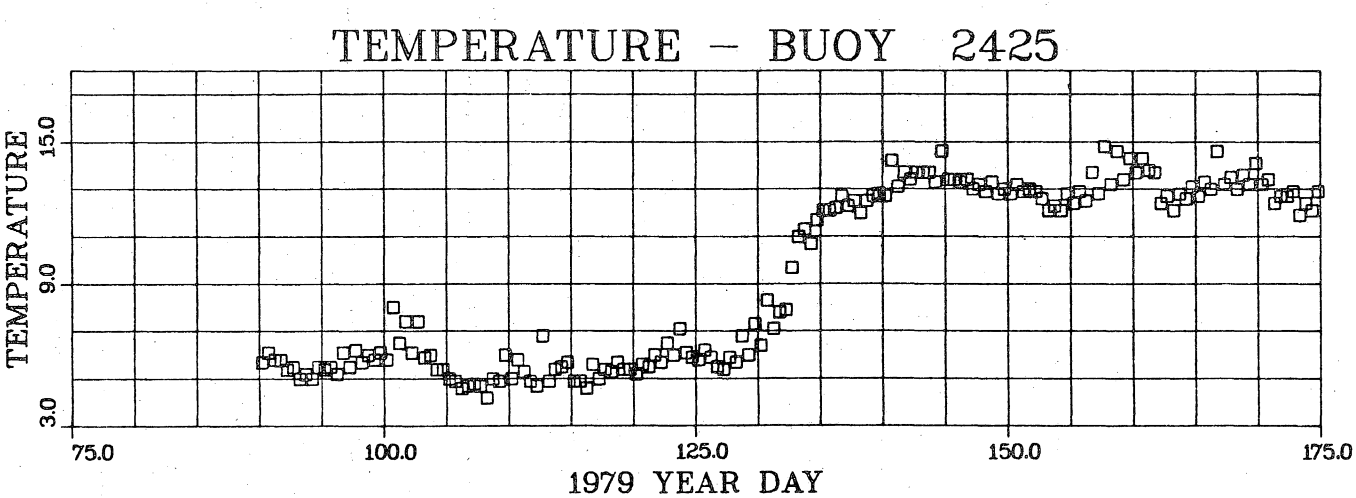
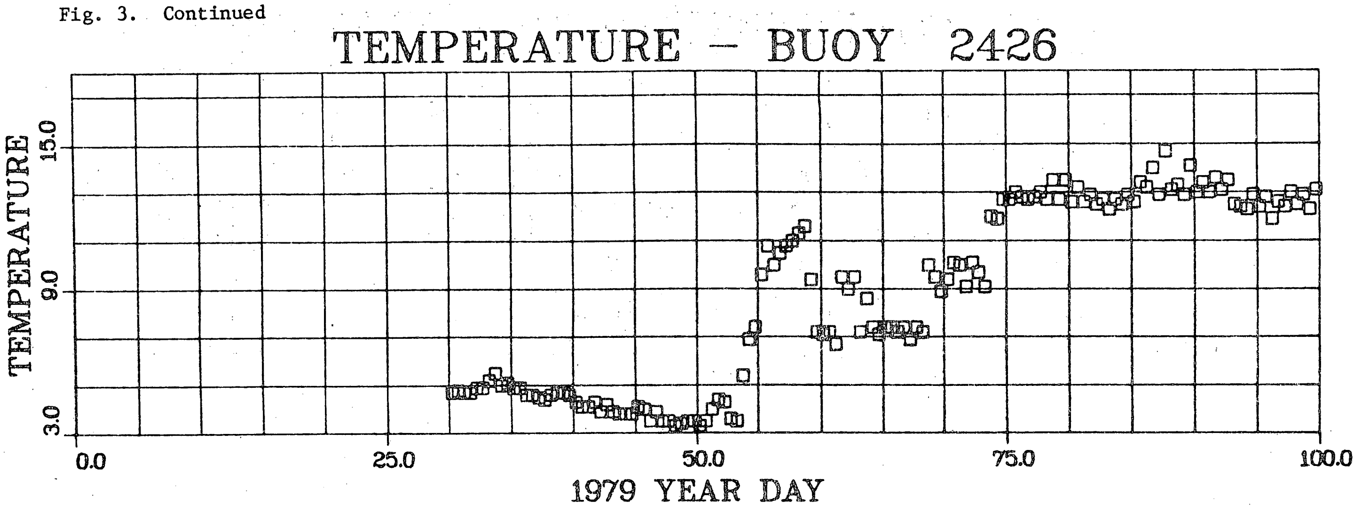
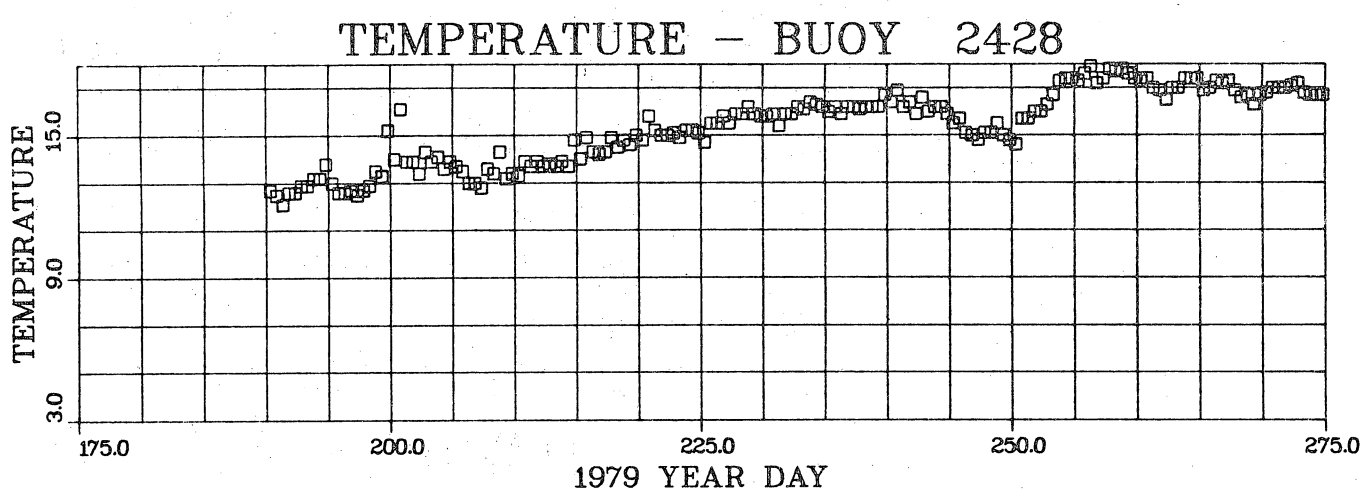
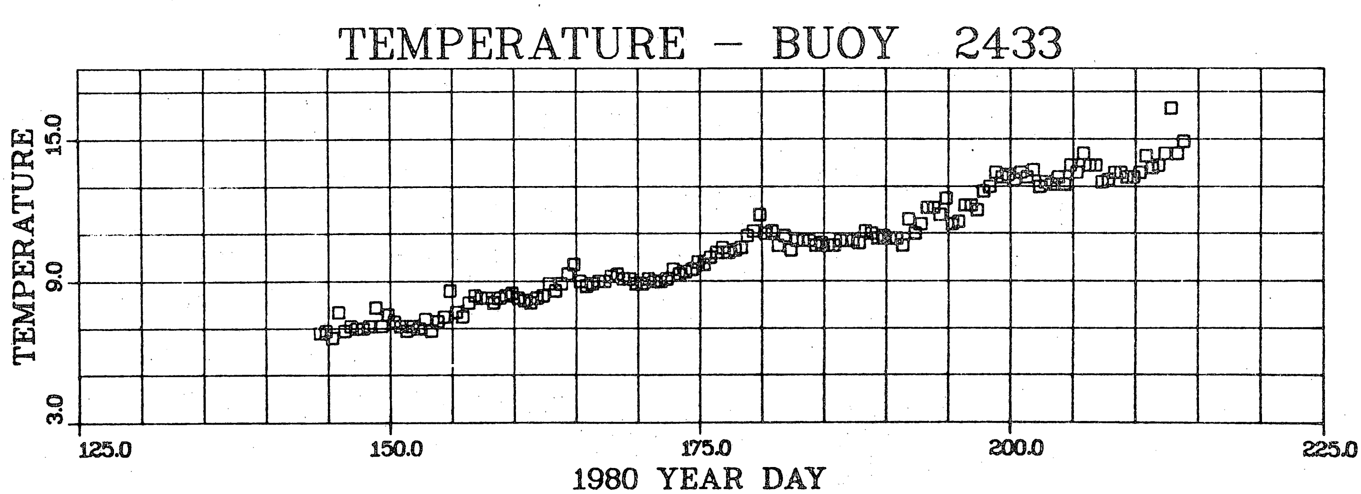


Figure 3: Temperatures as recorded by drifting buoys.

Fig. 3. Continued







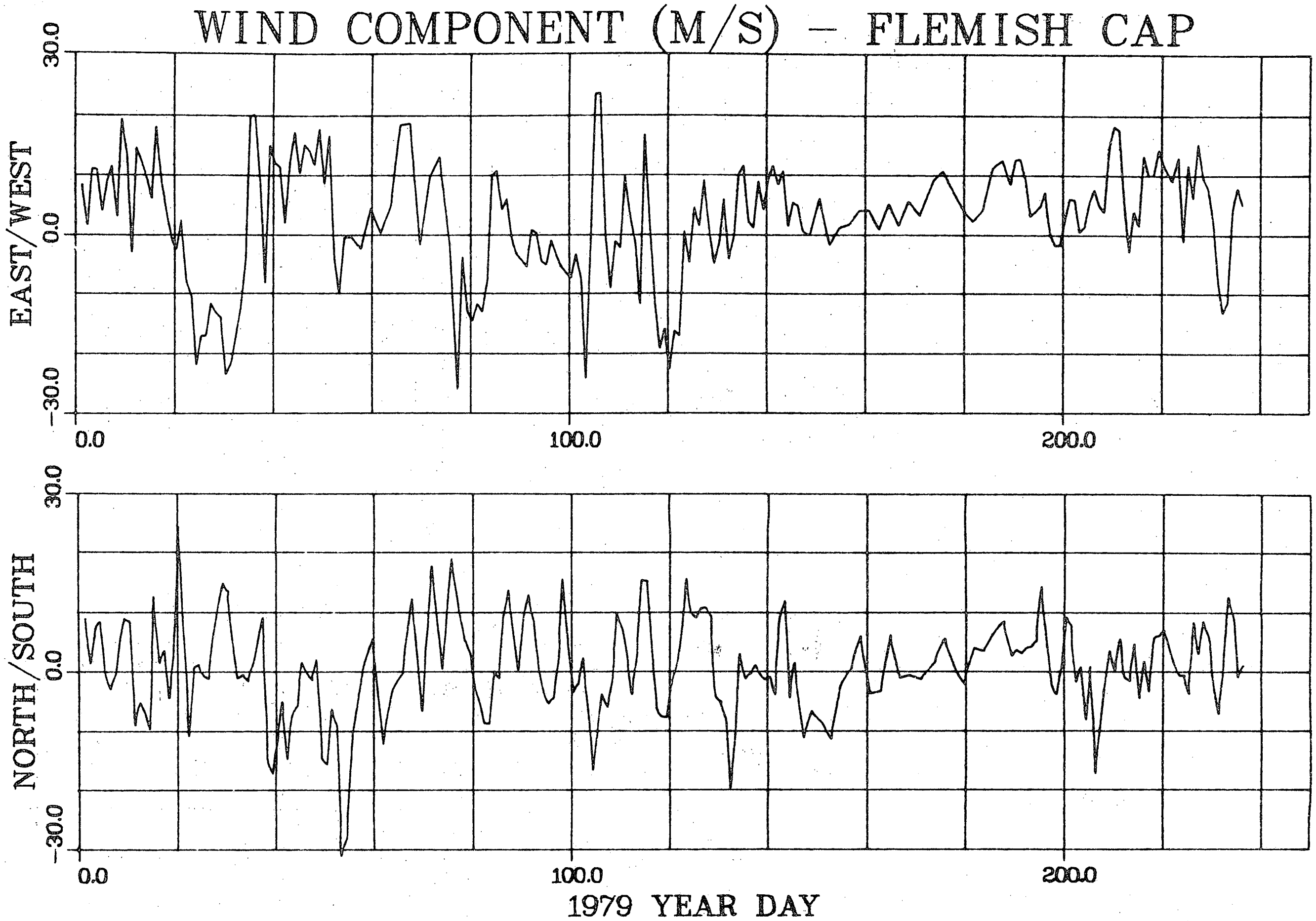


Figure 4: Components of geostrophic winds on Flemish Cap. Positive components are winds blowing to the east and to the north. Values are daily averages.

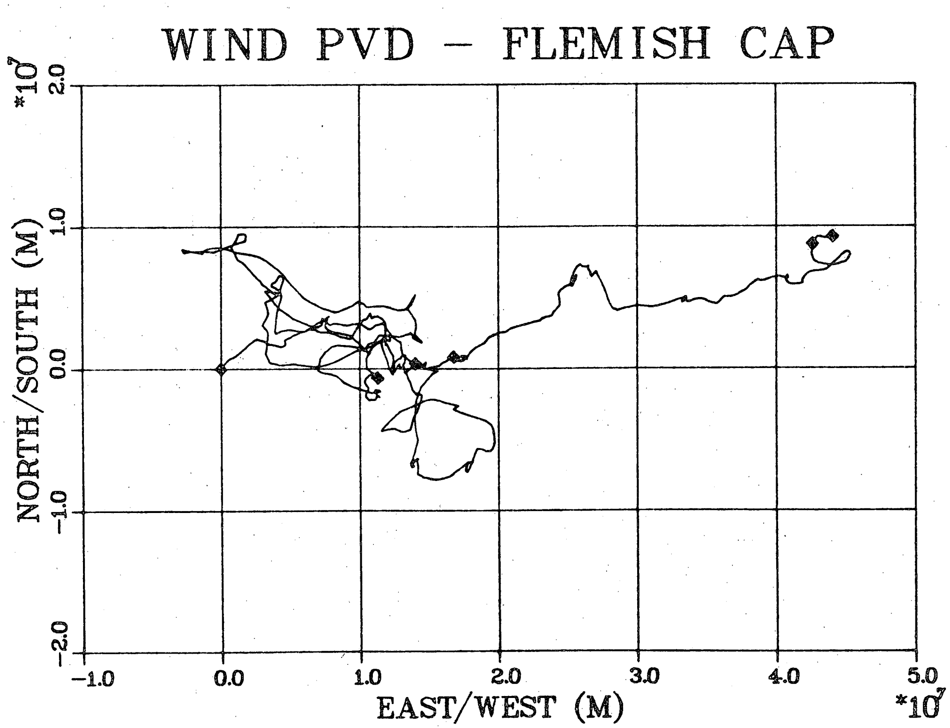


Figure 5: Progressive vector diagram of geostrophic winds on Flemish Cap. Starting poing is 0,0. Symbol marked every 50 days plus end of record.