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OCEANOGRAPHIC CONDITIONS ON THE NORTHERN BERING SEA SHELF: 1984-1985

S. Salo
R. D. Muench
J. D. Schumacher

Pacific Marine Environmental Laboratory
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C.William Verity
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Vernon E. Derr,
Director

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S. Salo[1], R.D. Muench[2], and J.D. Schumacher[1]

1. INTRODUCTION

Data presented in this Technical Memorandum were amassed as part of an experiment entitled the Arctic Polynya Experiment (APEX 85). The purpose of the experiment was to study mesoscale processes associated with ice formation in the polynya south of St. Lawrence Island, in the northern Bering Sea. Data were obtained from nine moorings containing seventeen current meters which were deployed near the island and in Bering Strait during October and November, 1984 (Table 1). The records from these instruments were analyzed, and their statistical properties, spectra, and time series comparisons among the records are presented in this memo. In addition, data are compared to time-series of local winds derived from surface level pressure fields.

1.1 Regional Geographical and Oceanographic Setting

St. Lawrence Island is located about 300 km south of Bering Strait in the northern Bering Sea (Fig. 1). It is separated from mainland Alaska by Shpanberg Strait, which is about 190 km wide and is shallower than 30 m over much of its width. Isobaths in Shpanberg Strait are aligned toward the north or northwest. Anadyr Strait, to the west of the island, is about 75 km wide and deepens to greater than 50 m within about 20 km of St. Lawrence Island. Its bathymetric axes trend toward the northeast. Bering Strait is approximately 85 km wide and 40-60 m deep, with generally north-south trending isobaths. The region just south of St. Lawrence Island where most of the moorings were clustered is less than 40 m deep. Isobaths are roughly parallel to the island except at 8401, the southernmost mooring.

Coachman *et al.* (1975) described three water masses in the Bering Sea north of 62°N. Furthest west and most saline is Anadyr Water. Its high salinity is probably a result of salt excluded from ice formed during the winter on the Anadyr shelf. To the east of this water is Bering Sea Water. The region near the Alaskan coast is occupied by Alaskan Coastal Water. Because of river input this water mass is the least saline of the three. Schumacher *et al.* (1983) also reported on these water masses.

Tides are predominantly diurnal on the outer Bering Sea shelf, but become weaker and more semidiurnal toward the north (Pearson *et al.*, 1981; Mofjeld, 1984). Tidal currents are decreased when ice is present, although it is unclear whether the measured changes are real or reflect the decrease in rotor pumping by surface waves. Tidal variance represents 2-64% of the total current variance during the winter at various sites in and near the area of the present study

[1] NOAA/PMEL, 7600 Sand Point Way N.E., Seattle, WA 98115-0070

[2] Science Applications International Corporation (SAIC), 13400B Northrup Way, Suite 36, Bellevue, WA 98005

(Salo *et al.*, 1983). Tidal currents contribute the smallest fraction of total variance at Bering Strait, Anadyr Strait, and sites just south and southwest of St. Lawrence Island. They comprise the largest percentage of the total current on the open shelf south of Shpanberg Strait.

Long-term mean currents over the northern Bering shelf are north-setting, although southward flow events may persist for days or weeks. This pattern is due to a sea level which slopes down toward the north and to winds which are usually from the north and northeast, especially during the winter. Mean transport through Bering Strait was estimated to be roughly 0.8 Sv toward the north by Coachman and Aagaard (1981). Aagaard *et al.* (1985) used wind records from 1946-1982 and the fact that the meridional component of the wind was well-correlated to existing current records and transport to determine a mean transport of 0.6 Sv. The prevalence of strong northerly winds in winter creates a strong seasonal cycle in transport with summer transport roughly 50% greater than winter transport. Daily transport through Bering Strait varies considerably in response to forcing by the wind. Coachman and Aagaard (1981) reported values ranging from 5 Sv southward to 3.1 Sv northward.

The vector mean directions and the axes of greatest variance of currents in the Bering Sea are usually close to the direction of the isobaths. This is especially true in the three straits, where more than 90% of the current variance is aligned with the bathymetric axis (Salo *et al.*, 1983). Mean winter scalar speeds on the order of 25 cm/s were reported in Bering Strait by Aagaard *et al.* (1985) and Salo *et al.* (1983). Salo *et al.* also determined scalar speeds of 15-20 cm/s in Anadyr and Shpanberg Straits. Vector mean speeds were on the order of 15 cm/s in Bering and Anadyr Straits, and 5 cm/s in Shpanberg Strait. The smaller ratios of vector mean/scalar mean speed in Shpanberg and Bering Straits suggest that more reversals occur there than in Anadyr Strait. Just south of St. Lawrence Island, 63-88% of the total variance occurred on the axis of greatest variance. Scalar and vector mean speeds were lower than in the straits; scalar speeds varied from 5-9 cm/s while vector speeds ranged from 1-3 cm/s and were often not significant.

Schumacher *et al.* (1983) hypothesized that the current in Anadyr Strait is a continuation of northward flow across the mouth of the Gulf of Anadyr. Kinder *et al.* (1986) called this flow a western boundary current. Schumacher *et al.* also noted a weak mean flow of 3.5 cm/s directed toward the east just south of St. Lawrence Island. This suggests that a part of the current from the Gulf of Anadyr continues eastward south of St. Lawrence Island.

Kinder *et al.* (1986) proposed that the water reaching Bering Strait crosses the Bering Sea shelf via two paths. A laboratory and a barotropic numerical model (which did not include atmospheric forcing) predicted that a low-salinity current flowing through Shpanberg Strait carries roughly 15% of the flow. A high-salinity western boundary current transports the remaining 85% of the Bering Strait flow. The western boundary current was predicted to be about 50 km wide with currents speeds of 10-20 cm/s. A barotropic numerical model presented by Overland and Roach (1987) predicted that Anadyr Strait water comprises 72% of the Bering Strait flow in the absence of northerly winds. Under normal winter wind stress, the model predicted southward mean currents in Shpanberg Strait but northward flow in Anadyr and Bering Straits. The result is a recirculation of water north of St. Lawrence Island.

2. METHODS

Nine APEX moorings were deployed near St. Lawrence Island inOctober 1984 from the R/V Alpha Helix. The Bering Strait mooring was deployed by helicopter in November 1984 (Fig. 1, Table 1). All moorings were taut-wire moorings and contained from one to three current meters.

Statistical parameters, correlation coefficients, spectra, and coherences were calculated using a program package called R2D2 (Pearson, 1981). This package was also used to display current roses and summary vectors. Eight bins, each 45° wide, were used in the current roses. Two different Lanczos cosine-squared tapered filters with half-power points of 2.86 hours and 35 hours were used on the records. The 2.86 hr filter was used when spectral bands were examined; the low pass filter was used in describing statistical characteristics of the currents.

The percent variance of one record coherent with another record was calculated from output from the R2D2 coherence output. Output from the R2D2 spectra routines was used to calculate the spectral variance in the following bands: periods greater than 10 days, periods from 2-5 days, periods from 2-10 days, and diurnal and semidiurnal tidal periods. Although the effects of low latitude storms are generally felt in the 2-5 day period, the 2-10 day band has often been considered in previous Bering Sea studies to examine meteorological forcing. Therefore, variance was calculated for both the 2-5 day and 2-10 day bands.

To examine seasonal variability of the currents, we split the records into three ninety-day periods. One lasted from mid-October to early January, one from early January to early April, and the third from early April to early July. We will refer to these periods as fall, winter and spring. Most stations were ice-free during much of the first period, ice-covered throughout the second period, and covered by melting ice during the latter part of the third period. It was impossible to compare equal-length ice-free and ice-covered records. Ice was already present at the site when the Bering Strait mooring was deployed (Table 1). Most of the other sites were ice-covered by 11 December, though 8402 and 8401 were ice ice-free until 1 and 15 January, respectively. Ice remained over the region until mid-June.

A program package called METLIB (Overland *et al.*, 1980; Macklin *et al.*, 1984) was used to generate surface winds from surface pressure fields obtained from the Fleet Numerical Oceanographic Center (FNOC). The gradient wind was calculated from the pressure fields; it was then rotated 30° toward lower pressure, and its magnitude was multiplied by 0.8.

3. RESULTS

3.1 Low-Frequency Currents

At Bering Strait, the current flowed strongly and consistently toward the north. Almost 98% of the variance occurred on the principal variance axis (Table 2; Figs. 2a,b). This axis coincided with the bathymetric axis, and was within 15° of the direction of the net current. The vector mean speed, 26.8 cm/s, was 78% of the scalar mean speed, further attesting to the steady northward flow. The current roses of Fig. 3 show that 74% of the flow was within 22.5° of due north with an average speed of about 40 cm/s. Six percent of the flow was toward the south at roughly the same average speed as the northward flow, and the remaining 20% was weak and directed to the SE-NE quadrant. Reversals to southerly flow occurred primarily in February and March, when there were three reversals each lasting roughly one week (Fig. 3a,b).

In Anadyr Strait, the vector mean current was directed toward the northeast, within 10° of the principal variance axis. The current was highly rectified, with more than 85% of its variance on the principal axis, which was 20°-40° to the right of the bathymetric axis (Table 2). The vector mean speed was greater than 20 cm/s and was 85% of the scalar speed; reversals were even less frequent here than at Bering Strait. Between 83% and 85% of the flow was directed toward 45-90°, with average speeds greater than 30 m/s at the top meter and 20-25 cm/s at the bottom meter (Figs. 2a,b). Episodes of southerly flow coincided with the February and March Bering Strait reversals, although they were weaker and of shorter duration (Figs. 3a,b).

At both sites in Shpanberg Strait, more than 95% of the variance occurred on the principal variance axis, which was about 5° from the bathymetric axis (Table 2). The vector mean current was 5-8 cm/s northward at less than 10° from the principal axes. The vector mean magnitude was respectively 32% and 52% of the scalar mean speed, which was itself lower than in the other two straits. Only 54-61% of the flow was directed toward the north or northwest, and 27-37% was directed toward the south and southeast (Fig. 2b). In particular, currents were weak and often southerly during February-April (Fig. 3b).

Currents at most sites south of St. Lawrence Island were weaker and more variable than in the straits. Between 69% and 74% of the variance occurred on the principal variance axes. Although these axes were less than 20° from the bathymetric axes, there was as much as 100° between the vector mean current direction and the principal axis. Net flow was eastward except at 8404's bottom meter, where it was south-southwestward and at 8401, where it was northward (Table 2). Scalar speeds at most sites were only about a third of scalar speeds in the straits. Vector mean speeds were 9-38% of scalar speeds, although they were significant at all moorings except 8404. Currents were stronger and more highly rectified at the SW and SE corners of the island. The scalar speed at 8406 was between speeds measured at Shpanberg and Anadyr Straits. The current rose at 8406 exhibits a strong east-west axis on which 76% of the flow occurred; 48% to the east and 28% to the west. Flow in the bight south of the island was also eastward more often than westward, though none of the meters had more than 39% of the flow on any one axis (Figs. 2a,b).

3.2 Mean and Net Wind

The surface wind was regionally homogeneous (Fig. 3c). Winds were predominantly from the north or northeast, with occasional periods of up to ten days when winds blew from the south. However, there were some consistent trends to the data (Table 2). The principal axis was oriented toward the NNW in Shpanberg Strait, and clocked steadily around to the NNE at stations further west. The vector mean wind was more northerly at western moorings and at Bering Strait than at eastern sites. The scalar and vector mean speeds and the percent variance occurring on the principal axes increased toward the north and west, although the differences in the vector mean speed were smaller than the RMS error.

3.3 Current Spectra

The highest total variances measured were at the SW corner of St. Lawrence Island and at Bering Strait (Figs. 4a-h). The lowest variances were in the bight south of St. Lawrence Island. The average total spectral variance at the moorings in the three straits was 542.4 cm/s^2. South of St. Lawrence Island, the average was 428.6 cm/s^2; 284.6 cm/s^2 if the atypical record from 8406 at the SW corner of the island is excluded. It is unclear which of the two southern straits was more energetic. Total variance measured at the two Shpanberg moorings was between the variance at the two meters on the Anadyr mooring. Total variance decreased with depth at all moorings with more than one meter, and the depths of the Shpanberg moorings were intermediate between the depths of the Anadyr meters.

Variance on the minor axis was generally a factor of ten less than variance on the principal axis. The only case where variance on the minor axis surpassed variance on the principal axis was in the semidiurnal tidal band at 8401. Current spectra at all meters were red except for peaks at tidal periods (Figs. 4a-h). In the three straits and at 8406, more variance was in the >10-day band than in any other, while at every other site variance was greatest in the tidal band. Records of stations in the first region contained 37-63% of their variance in periods >10 days and 2-26% of their variance at tidal periods. The other stations had 10-15% of their variance in the >10-day band and 37-65% of their variance at tidal periods. At moorings with more than one meter the percent variance at periods >10 days increased with depth, and the percent at tidal periods decreased with depth.

There was less regional difference of the percent variation at 2-10 day and 2-5 day periods than for the bands discussed above. South of St. Lawrence Island, 19-33% of the variance was in the 2-10 day band and 13-20% was at 2-5 day periods. In the straits and at 8406, 26-35% of the variance was at 2-10 day periods and 14-19% at 2-5 day periods. Like long-period variance, the percent variance in the 2-10 day and 2-5 day bands increased with depth.

3.4 Wind Spectra

Like the current spectra, wind spectra were red. As would be expected from the fact that only 55-68% of the winds' variance occurred on their principal axes (Table 2), variance on the principal and orthogonal axes were of approximately the same magnitude. There was less than a 10% difference between the highest total wind variance (at Bering and Shpanberg Straits) and the lowest (at the westernmost moorings). At all moorings, 54-62% of the total wind variance was at periods greater than 10 days, about 35% was at periods of 2-10 days, and about 20% was at 2-5 days.

3.5 Correlation and Coherence

All correlation coefficients computed from records of meters on the same mooring were 0.9 or greater and were highest at 0 lag (Table 3). Meters on the same mooring were coherent at all periods (Fig. 5a). Most of the cross-variance for these comparisons was at periods greater than 7.5 days (9.1 days at 8401), although records from meters south of St. Lawrence Island exhibited little cross-variance at 11.7 days, and all three comparisons showed energy at one or more periods near 4 days.

Bering Strait currents were better correlated with Shpanberg Strait currents than with those at Anadyr Strait (Table 3). Correlation coefficients between Bering Strait and Anadyr Strait moorings were about 0.53. Bering Strait flow was coherent with current at Anadyr Strait in three bands: from 16-26 days, at 6.4 days, and at 4-5 days (Table 5b). Most cross-variance was found in the 16-26 day band. Correlation coefficients with Shpanberg Strait moorings 8410 and 8411 were 0.77 and 0.66. Although currents at both sites in Shpanberg Strait were highly coherent (Fig. 5a), Bering Strait flow was more coherent with 8410 than 8411. There were only four periods, all at 2.5-4.4 days, where Bering Strait flow was not coherent with flow at 8410. The cross-variance was highest at periods greater than 9 days. The only significant lag was at 3.96 days, where 8411 led Bering Strait by 8 hours. 8411 also led 8410 at this period (Fig. 5a).

Current fluctuations in Anadyr Strait were not correlated to those in Shpanberg Strait; none of the correlation coefficients were significant (Table 3). Less than 3% of flow at Anadyr Strait was coherent with Shpanberg Strait currents, while 3-4% of 8410's current and 8-9% of 8411's current were coherent with Anadyr Strait flow (Table 4). Flow in the two straits was coherent only at 3.62 and 3.96 days, and there was little cross-variance at these periods.

Flow at all moorings south of St. Lawrence Island except 8404 was better correlated with Shpanberg Strait than with Anadyr Strait flow (Table 3). Except for 8401, all correlations with Shpanberg Strait were negative, and correlations with Anadyr Strait were positive. This indicates that northward flow in Shpanberg Strait was correlated to westward flow south of St. Lawrence Island (or southward flow in Shpanberg Strait was associated with eastward flow south of the island). Northward flow in Anadyr Strait was associated with eastward flow south of St. Lawrence Island. Correlations were improved when the strait's record lagged the record south of St. Lawrence Island by 6-12 hours. Seven to 17% of 8404's current was coherent with Shpanberg current and 30-33% with Anadyr flow (Table 4). At the other sites, 0-7% of the current was coherent with Anadyr flow and 11-80% with Shpanberg currents.

Currents at 8404 were most coherent with Anadyr Strait at 3.6-9.1 days, with the greatest cross-variance at 4.4 and 70 days. Current fluctuations at 8404 were discontinuously coherent with current at 8410 in Shpanberg Strait from 2.9 to 6.4 days, though there was energy only at 3.96 and 6.4 days. It was less coherent with 8411. All significant coherences with Shpanberg Strait currents were lagged and in all unambiguous lags Shpanberg current fluctuations led those at 8404.

Correlation coefficients for comparisons between records from any two southern meters were significant. The largest coefficient was .73, between 8406-8404 and 8406-8401. The smallest coefficient was -.37 in the 8403-8401 comparison; current fluctuations at 8403 were highly correlated only to flow at 8404. Correlations among currents at 8406, 8403, and 8404 were all positive, but correlations of any of these with 8401, like correlations with Shpanberg Strait, were negative (Table 3). Only one set of coherences for this region is displayed in Fig. 5c. Current at 8404 was coherent with flow at 8403 at most periods, and the cross-variance was fairly evenly distributed through the spectrum. Four lags were significant; 8403 led 8404 by 4 to

52 hours. Flow at meters 8403 and 8406 were less coherent than 8403-8404. Their coherence was predominantly at 2.9-6.4 days, and only four of the coherent periods had more than 5% of the total cross-variance. At 6.4, 4.9, 3.3, and 3.1 days 8404 led 8406 by 9-14 hours. 8404 was coherent with 8401 at only five scattered periods, from 70 days to 2.5 days. All peaks except the 3.3 day peak contained energy, and all lags were indistinguishable from ±180° except the 5.5-day peak, where 8404 lagged 8401 by 51 hours.

A major problem in correlating currents to winds was the choice of a wind axis, especially since at most sites only 55-60% of the wind variance was on the principal axis. Thus, correlations and coherences are presented for two wind axes: the wind's principal axis and the axis (to the nearest 10°) with which the greatest percent of the current variance was coherent. We will refer to this second axis as the associated axis. The winds' principal axes, to the nearest 10°, were 170-200° (Tables 2, 5). In the straits, the associated axes were 20-50° anti-clockwise of the principal axes of the wind and 100-170° from the principal axes of the currents. The two wind axes were separated by 40-90° in the region south of St. Lawrence Island. The wind variance on the associated axis was 71-96% of the variance on the principal axis in the straits. It was 65-85% of the principal axis variance south of St. Lawrence Island.

Currents in Bering and Shpanberg Straits were better correlated and more coherent to the wind than was current in Anadyr Strait. In Bering and Shpanberg Straits, correlation coefficients between the currents and wind respectively on its principal and associated axes were about -.7 and -.8 (Table 3). From 36-50% of the variance in these straits was coherent with the wind on its principal axes, while 64-74% of the current was coherent with the wind on its associated axes. In Anadyr Strait, the coefficients were -.53 and -.55. Only 20% and 41% of the variance of Anadyr Strait's upper meter was coherent with wind on the two axes. All the correlation coefficients were obtained when the current lagged the wind by 6-12 hours.

Most of the cross-variance for wind-current coherences in the three straits was at periods greater than 9 days, although at 8411 in Shpanberg Strait the "high-energy" band extended down to 4 days (Fig. 5d). Bering Strait current was coherent with wind on either axis at most periods. In Shpanberg Strait, although the magnitude of the coherences was similar to those in Bering Strait, there were more periods where the currents and winds were not coherent. Anadyr Strait current was coherent with the wind only in isolated peaks. A peak at 26.2 days dominates the coherence spectra, especially in the comparisons involving the wind on its principal axes. Greater than 30% of the cross-variance in Bering and Anadyr Straits, and 10-30% of the cross-variance in Shpanberg Strait was found at that period.

Currents in the region south of St. Lawrence Island were less correlated to the wind than were the currents in the Bering and Shpanberg Straits. Except at 8401, they were also less coherent with the wind, especially at long periods (Fig. 5e). The variance in the cross-spectra was shifted toward shorter periods; the spectra contain a greater percent of their cross-variance at periods of 3.5 to 5.5 days than spectra in the straits except 8411. Currents were more coherent with the wind at 8406 and especially 8401 (which resembled 8411) than in the bight of the island. The wind's principal axis was sometimes perpendicular to the principal axis of the current in this region; current was especially poorly correlated to wind on this axis. From 0-13%

of the currents was coherent with winds on their principal axes, and from 8-47% was explained by winds on their associated axes.

4. SEASONAL VARIABILITY

4.1 Total Current Variance and Partitioning of Variance

Total current variance was highest at all meters during autumn (Table 6; Figs. 6a-f). Winter variance at most sites was 70-88% of fall variance, although at 8403 it fell to 53%. At 8 out of 12 meters, variance further decreased to 30-40% of fall variance during the spring. Other meters showed less of a decrease. At Bering Strait, variance during the spring was 28% of winter variance.

The decreases in variance were not uniformly distributed in the spectrum, leading to shifts in the relative importance of different bands. One shift which occurred in Anadyr Strait and at most southern moorings was that the percentage of the total variance at periods greater or equal to 2 days increased in the winter and then decreased in the spring. For example, at the top meter in Anadyr Strait respectively 77%, 82% and 49% of the total variance was in these bands during the three seasons. This pattern did not occur in Shpanberg Strait and at 8401. There, the variance at 2-5 days increased to up to 182% of autumn values. However, the variance at 2-10 days decreased sharply enough that the percent of the total variance at greater or equal to 2 days decreased during the winter.

4.2 Wind Variance

There was relatively little change in total wind variance from autumn to winter, but variances decreased greatly during spring. Although regional differences in the changes may not be significant, they showed an east-west trend. Total wind variance in Bering and Shpanberg Straits increased during winter to 102-120% of autumn variance. At other moorings, winter variance was 85-96% of autumn variance, with greater decreases at the western sites. Spring variances were 31-55% of fall variances. Again, decreases were greater in the west than the east. Thus, wind at Anadyr Strait had the greatest autumn variance, but the lowest spring variance.

In winter, wind variance at periods >10 days increased to 108-139% of autumn variance in this band at all sites except Anadyr Strait and 8406. Winter variance at periods >10 days accounted for more than 62% of the total variance at all moorings. Variance in this band decreased in spring to 24-57% of fall values, with the largest decreases occurring in the west.

Wind variance in the 2-5 day band increased slightly during winter at Bering and Anadyr Straits, but decreased at other sites to 84-94% of fall variances. Variance in the 2-10 day band decreased everywhere to 58-91% of autumn values. The largest decreases occurred at southern meters. Spring variances in both bands were respectively 36-46% and 41-65% of fall values, with the largest decreases in the west.

4.3 Scalar and Vector Mean Currents

Variation in the current's scalar means resembled that of the total variance at all sites except at the bottom meter at 8404, but the net current magnitude showed a different pattern. In both Anadyr and Shpanberg Straits, the vector mean magnitude was weakest during winter. In Bering Strait, winter magnitude was the weaker of the two seasons sampled. Vector mean magnitudes were similar in Anadyr and Shpanberg Straits in the fall. The winter vector mean magnitude in Anadyr Strait was 84-85% of its autumn value while at Shpanberg Strait winter magnitude dropped to 21-32% of the autumn value. The magnitude at 8411 was not significant. In Anadyr Strait, the highest vector mean magnitude and smallest RMS error occurred in the spring, but Shpanberg Strait net current remained near the winter values, although the RMS error decreased. South of St. Lawrence Island, all autumn vector mean magnitudes were significant, but only 2 of 5 winter magnitudes and 4 of 6 spring magnitudes were. Net magnitude at three of the 6 full-time records decreased throughout the three seasons.

In Shpanberg and probably Bering Straits, winter currents were southward during a greater percentage of time than during the other two seasons (Figs. 3a,b; Figs. 6a-f). In Anadyr Strait, the maximum duration of reversed (toward the southwest) flow occurred in autumn. Currents were northward about 80% of the time during autumn in Shpanberg Strait, and were toward the N-E quadrant 80-85% of the time in Anadyr Strait. In winter, currents were northward about 55% of the time in Shpanberg Strait and 73% of the time in Bering Strait. In Anadyr Strait, currents were toward the N-E quadrant 85-90% of the time although 13% of flow at the surface meter was directed across the strait toward St. Lawrence Island. A greater percentage of flow was eastward than during autumn at both meters. During spring, currents were northward only 64-75% of the time in Shpanberg Strait. Currents in Bering and Anadyr Straits were respectively toward the north and N-E quadrant 99% of the time. The percent of flow at Anadyr Strait's surface meter directed toward the east continued to increase; from 43% in the winter to 66% in the spring.

During all three seasons, a greater percentage of the currents at most moorings just south of St. Lawrence Island was toward the NE-SE quadrant (at 8406 and 8402) and the E-S quadrant (at 8403 and 8404) than in the reverse sense. There was too much scatter in the data from moorings in the bight of the island to allow definition of seasonal trends, but at the mooring near the southwest corner of the island the percentage of eastward currents was lowest in the autumn and highest in the spring.

4.4 Scalar and Net Mean Winds

Scalar and vector mean magnitudes of winds at almost all moorings were greatest during winter and lowest during spring. Autumn and winter magnitudes were similar (vector mean magnitudes were not significantly different), but spring magnitudes were substantially lower. The vector mean wind was from the northeast during the autumn and veered toward northerly during the winter and spring (Table 6; Figs. 6a-f).

4.5 Correlations

Correlation coefficients between current fluctuations in the straits varied seasonally. Currents at Anadyr Strait were best correlated with Bering Strait flow during the winter (Table 7a-c). During the spring the correlation coefficient for the two records was not significant. Currents in Bering and Shpanberg Straits were well correlated during both winter and spring. Currents at Anadyr Strait were not well-correlated with Shpanberg Strait flow during fall or winter, but were correlated with currents at 8411 (and 8401, just south of Shpanberg Strait) during spring. The correlation coefficient for these comparisons was negative and increased when Anadyr Strait current lagged that at 8411 or 8401 by 6-12 hours.

Current fluctuations in Shpanberg Strait were correlated to those at southern moorings except 8403 during all three seasons. Shpanberg Strait flow was not significantly correlated to flow at 8403 during winter (Table 7a-c). Correlation coefficients were highest during autumn in 7 of 12 comparisons, but there was no consistent geographical pattern to the seasonal trends. In contrast, current at Anadyr Strait was correlated to flow only at 8404 during all three seasons. It was correlated to flow at 8403 and 8401 only during spring, and to flow at 8406 only during winter and spring. The signs of the correlation coefficients of comparisons between a record from one of the straits and a record from south of St. Lawrence Island was the same as the signs of the full-length correlations. In nearly all comparisons, the current at the straits lagged current at the stations south of St. Lawrence Island.

Seven of the eleven correlations of records in the region south of St. Lawrence Island were highest in autumn (Table 7a-c). Winter decreases in correlation were especially drastic in the comparisons of 8403 with 8406 or 8401. In most cases the signs and phase lags remained constant, as described in the full-time correlation section above.

4.6 Seasonal Wind Correlation

Current fluctuations in the straits were best correlated to wind on its associated axis during the winter, while currents at the southern moorings were best correlated to this wind component during autumn (Table 7a-c). Seasonal variation in the coefficients was greatest in Anadyr Strait and at 8404. Current fluctuations were correlated to wind on either the associated or principal axis except at 8404, where they were not correlated to wind on its principal axis.

5. DISCUSSION

Currents in Anadyr and Bering Straits reflect global-scale forcing (Kinder *et al.*, 1987), but flow in Shpanberg Strait is more affected by regional-scale processes. During the winter of 1984-1985, the current in Anadyr Strait was more steadily northward-setting than current in either Shpanberg or Bering Straits. Its fluctuations were uncorrelated to fluctuations in Shpanberg Strait, and during the spring were even uncorrelated to those in Bering Strait. Current fluctuations in Anadyr Strait were also less correlated with winds than were currents in the other two straits.

During winter, the predominant northerly wind opposes the northward flow of current in the straits. Shpanberg Strait flow is particularly affected by this wind and may reverse for long periods. Currents in Bering and Anadyr Straits are less likely to reverse. However, flow in Anadyr Strait may become more easterly during periods of increased southward flow in Shpanberg Strait. This suggests that eastward recirculation of water may occur north and south of St. Lawrence Island. Recirculation was also suggested in 1986 by the trajectory of two ARGOS buoys deployed by Carol Pease off the northwest corner of St. Lawrence Island. Despite easterly and northeasterly winds these buoys drifted eastward and then south through Shpanberg Strait (personal communication).

Flow south of St. Lawrence Island is complex. The current fluctuations of records from the bight of the island were well correlated among themselves and were generally better-correlated to fluctuations in Shpanberg Strait than those in Anadyr Strait. This suggests that flow in Shpanberg Strait and south of St. Lawrence Island are affected by the same regional-scale forcing.

6. SUMMARY

Long-term mean currents in Bering, Anadyr, and Shpanberg Straits were north-setting and highly rectified. From 85-98% of the variance occurred on the principal axes, which nearly coincided with the local bathymetric axes in Bering and Shpanberg Straits and were 20-40° eastward from the bathymetric axis in Anadyr Strait. Scalar and vector mean magnitudes were greater in Bering and Anadyr Straits than in Shpanberg Strait. Currents in the region south of St. Lawrence Island were weaker and less rectified than currents in the straits, although most vector mean magnitudes were significant. The vector-mean flow was eastward or southeastward at most moorings.

The data suggest that eastward recirculation of water from Anadyr Strait north and south of St. Lawrence Island occurred during winter. During autumn, the mean magnitudes of the currents in Anadyr and Shpanberg Straits were similar. During winter, the scalar mean magnitudes decreased slightly in both of these straits. Due to frequent flow reversals in Shpanberg Strait, the vector mean magnitude there dropped sharply to 21-32% of its autumn value. Flow reversals in Bering Strait during winter coincided with most reversals in Shpanberg Strait, though they were generally weaker and of shorter duration. The vector mean magnitude in Anadyr Strait showed only a small decrease during this period, since flow reversals there were less frequent and of shorter duration than in the other two straits. The percentage of east-directed currents in Anadyr Strait did increase during winter, so that the vector mean direction was 10-15° east of its autumn direction. This suggests that water from Anadyr Strait was being recirculated north of St. Lawrence Island. Eastward flow south of the the island during decreased flow in Anadyr Strait suggests recirculation also occurred south of the island. During spring, the scalar mean magnitude decreased further in Shpanberg Strait but increased in Bering and Anadyr Straits, as did the vector mean magnitudes.

There was little geographic difference in winds over the study region. Winds were predominantly from the north and northeast. The vector mean wind, directed toward the southwest at all moorings during autumn, became progressively more south-directed during winter and spring. Scalar mean magnitudes were similar during autumn and winter but were much lower in spring. Vector mean magnitudes were highest during winter and lowest during spring, although the differences between autumn and winter magnitudes were less than the RMS errors. The increase was especially small in Shpanberg Strait. Total wind variance was greatest during autumn at all locations except Bering and Shpanberg Straits. In Anadyr and Bering Straits the total wind variance during winter was respectively 85% and 120% of its autumn value, but there was little difference between the two seasons in Shpanberg Strait and other eastern moorings. Total wind variance was substantially lower during spring at all sites. Given the relatively stable wind conditions in Shpanberg Strait, it is unlikely that the sharp drop in the vector mean current magnitude which occurred in the strait during winter to local wind forcing, although the change in wind direction made the wind more effective in countering the current. The wind at Bering Strait would appear to be more important, as in Aagaard *et al.* (1985).

Bering Strait current fluctuations were better correlated to (and coherent with) current fluctuations in Shpanberg Strait than those in Anadyr Strait. Most of the cross-variance of the coherence spectra was at long periods. Fluctuations in the latter two straits were virtually uncorrelated except during spring. During that season, flow in Anadyr Strait was uncorrelated to currents in Bering Strait, but was correlated to flow at the station in the center of Shpanberg Strait. Flow in the region south of St. Lawrence Island was generally better correlated to flow in Shpanberg Strait than in Anadyr Strait. Eastward fluctuations in the southern region were correlated to southward flow in Shpanberg Strait and to northward flow in Anadyr Strait. Current fluctuations in the southern region were correlated among themselves, although flow at 8403 nearest the shore in the bight of the island was highly correlated only to flow at 8404 just offshore from it.

The currents in the straits were better correlated to wind on axes directed toward the south or southeast than to winds on the principal axes themselves. Currents in Shpanberg and Bering Straits were more coherent with the wind than were currents in Anadyr Strait. Most of the cross-variance of the coherences was at periods greater than 9 days. South of St. Lawrence Island, winds were less coherent with the wind than winds in Bering or Anadyr Strait.

7. ACKNOWLEDGMENTS

This Technical Memorandum is a contribution to the Marine Services Project at NOAA's Pacific Marine Environmental Laboratory in support of the Navy-NOAA Joint Ice Center. This work has been carried out with support from National Science Foundation grant DPP-8409423 to Science Applications International Corporation (S.A.I.C) (R.D.M), Office of Naval Research (ONR) contract N00014-82-C-0064 with S.A.I.C. (R.D.M.), and the Marine Services Research Division of NOAA's Pacific Marine Environmental Laboratory supported in part by the Arctic program, ONR (J.D.S. and S.S.). NOAA PMEL contribution 1004.

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FIGURES

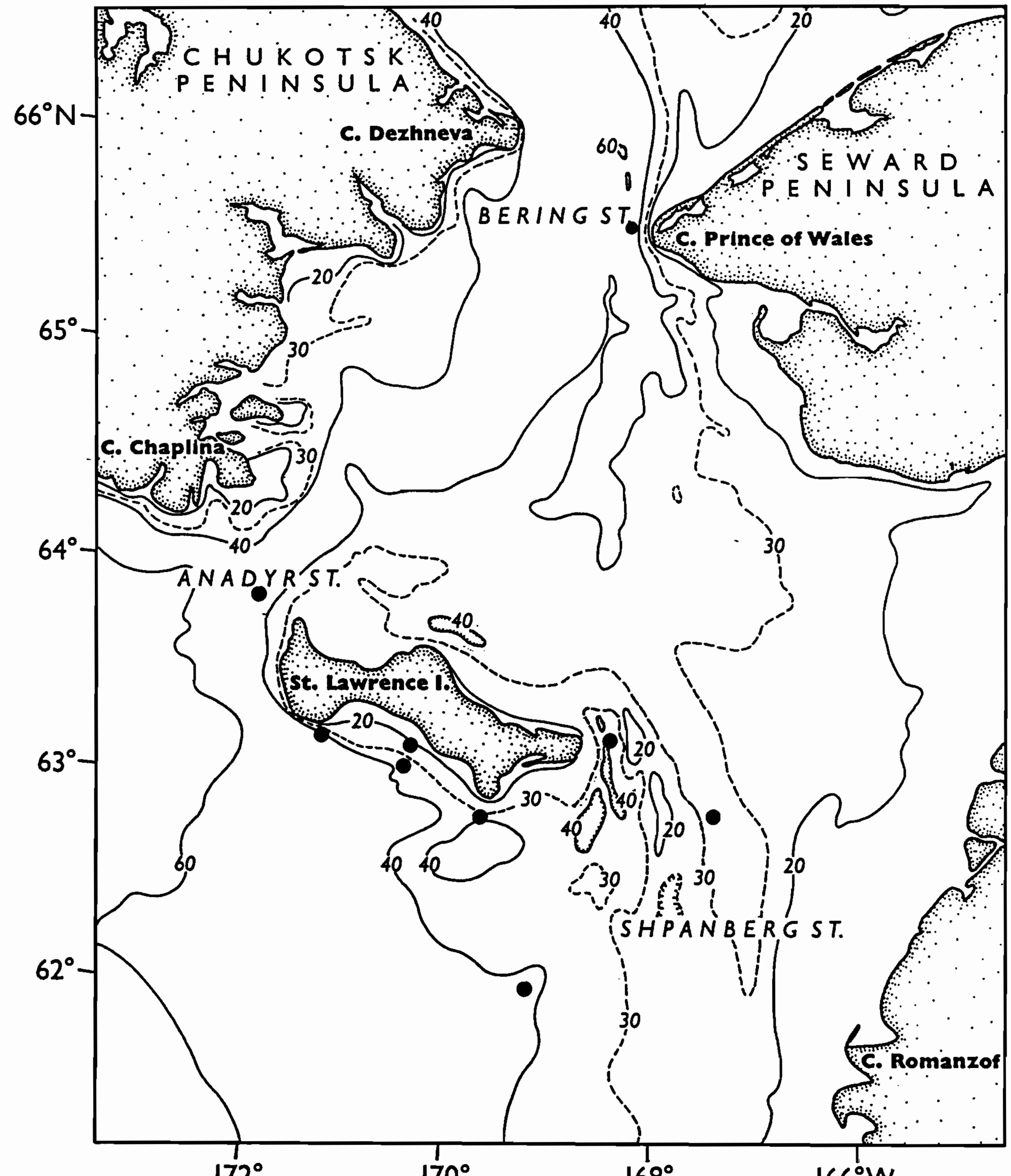


Figure 1: Location of Moorings.

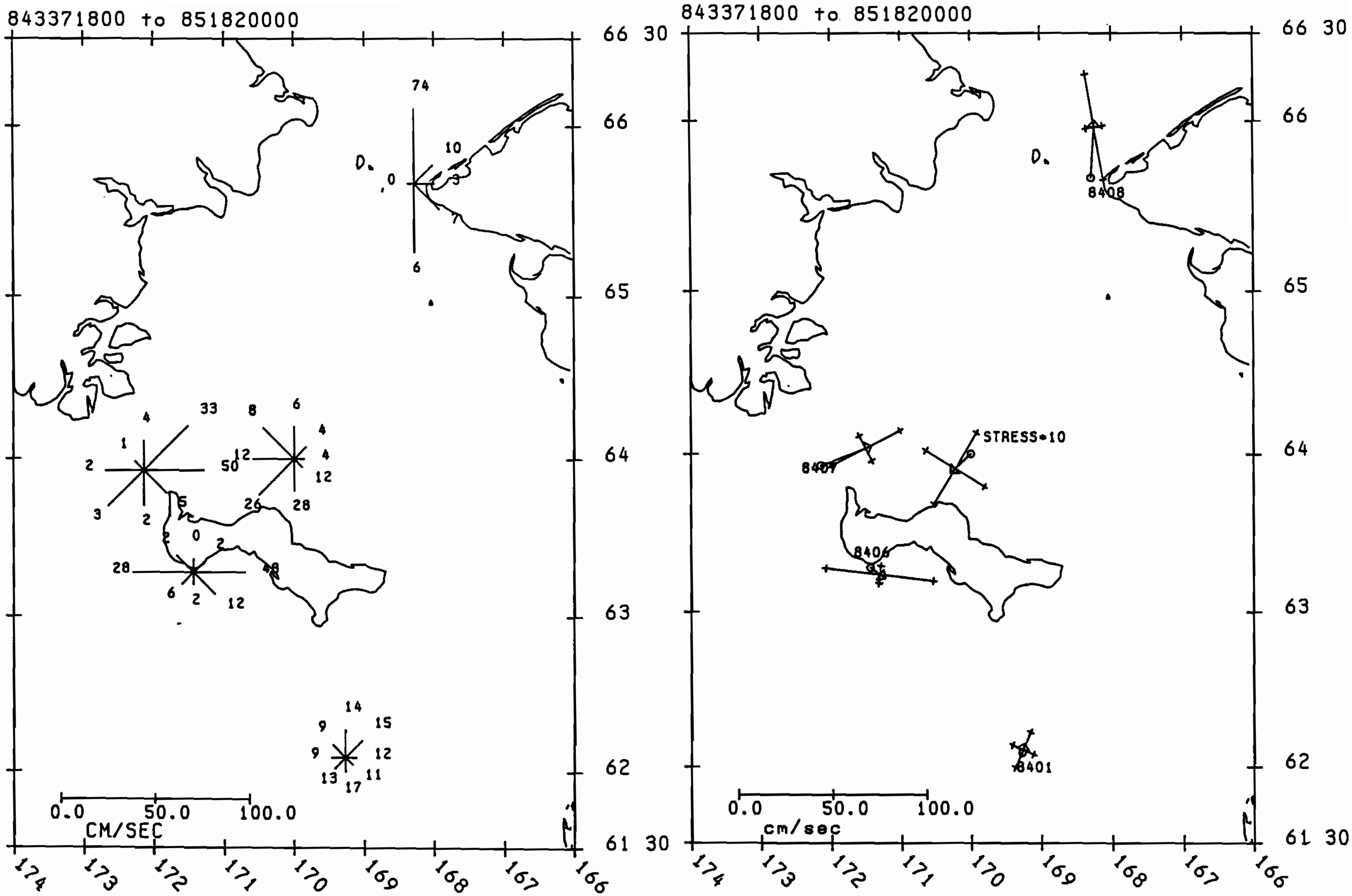


Figure 2a: Current roses and summary vectors at all full-time near-surface meters, and at Bering Strait. In this and all similar figures, the wind-stress depicted just north of St. Lawrence Island was actually calculated from METLIB winds at position 8403 just south of St. Lawrence Island. Numbers surrounding the roses report the percent of currents or winds in the direction indicated by the line. The length of the line indicates the mean speed in that direction. In the summary vectors plots, the arrow presents the vector mean magnitude and direction, while the cross at the head of the arrow presents the variance on the current's principal axis and its orthogonal. All directions are given in the oceanographic convention.

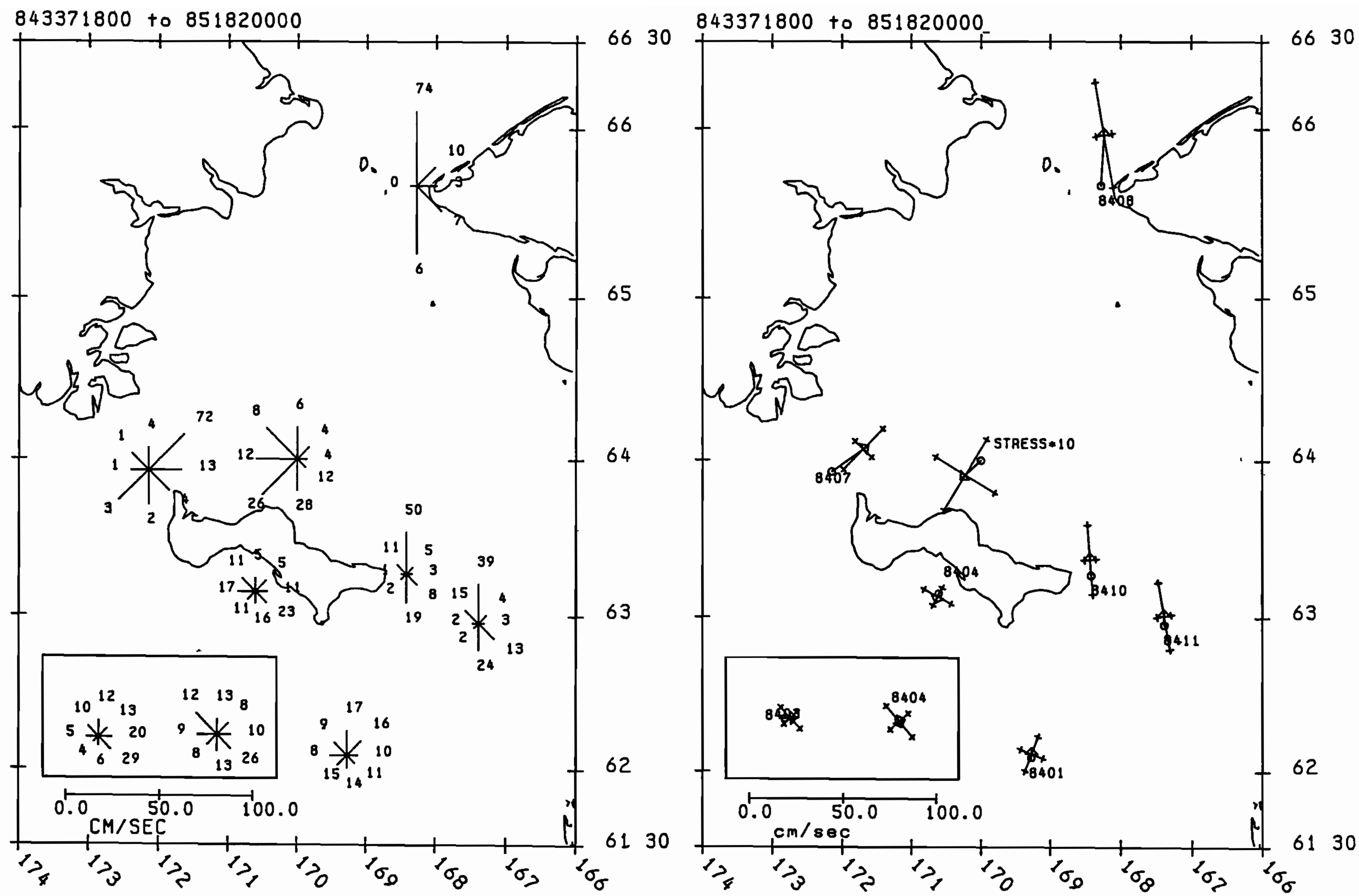


Figure 2b: Current roses and summary vectors at all full-time bottom meters. The roses and vectors in the box belong at 8403 and at the mid-depth 8404 meter.

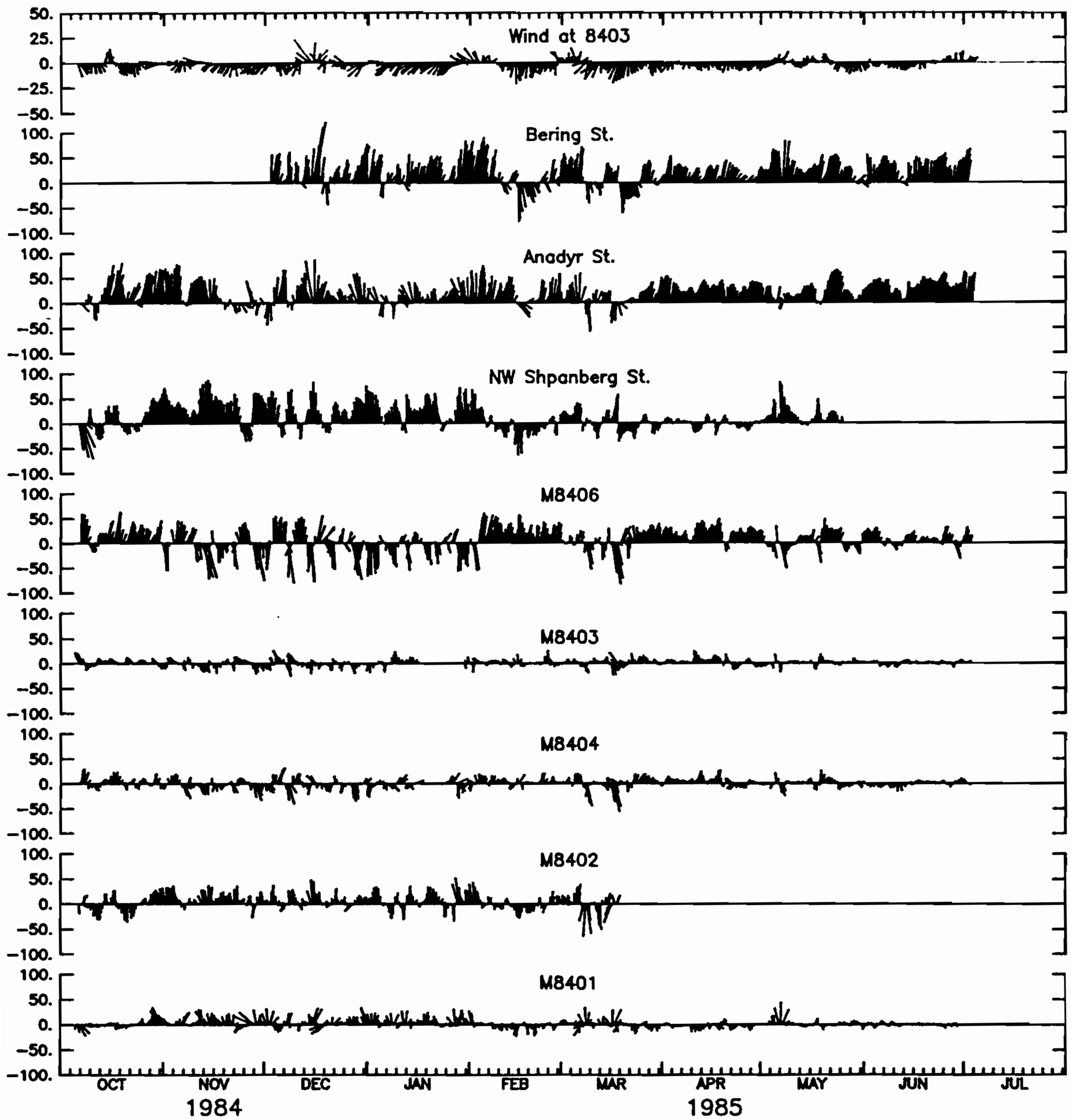


Figure 3a: Stick vectors of 35-hr filtered currents at near-surface meters , rectified on their principal axes. Every other vector is plotted. The Bering Strait meter is included for comparison with the other 2 straits, although it was not a surface meter.

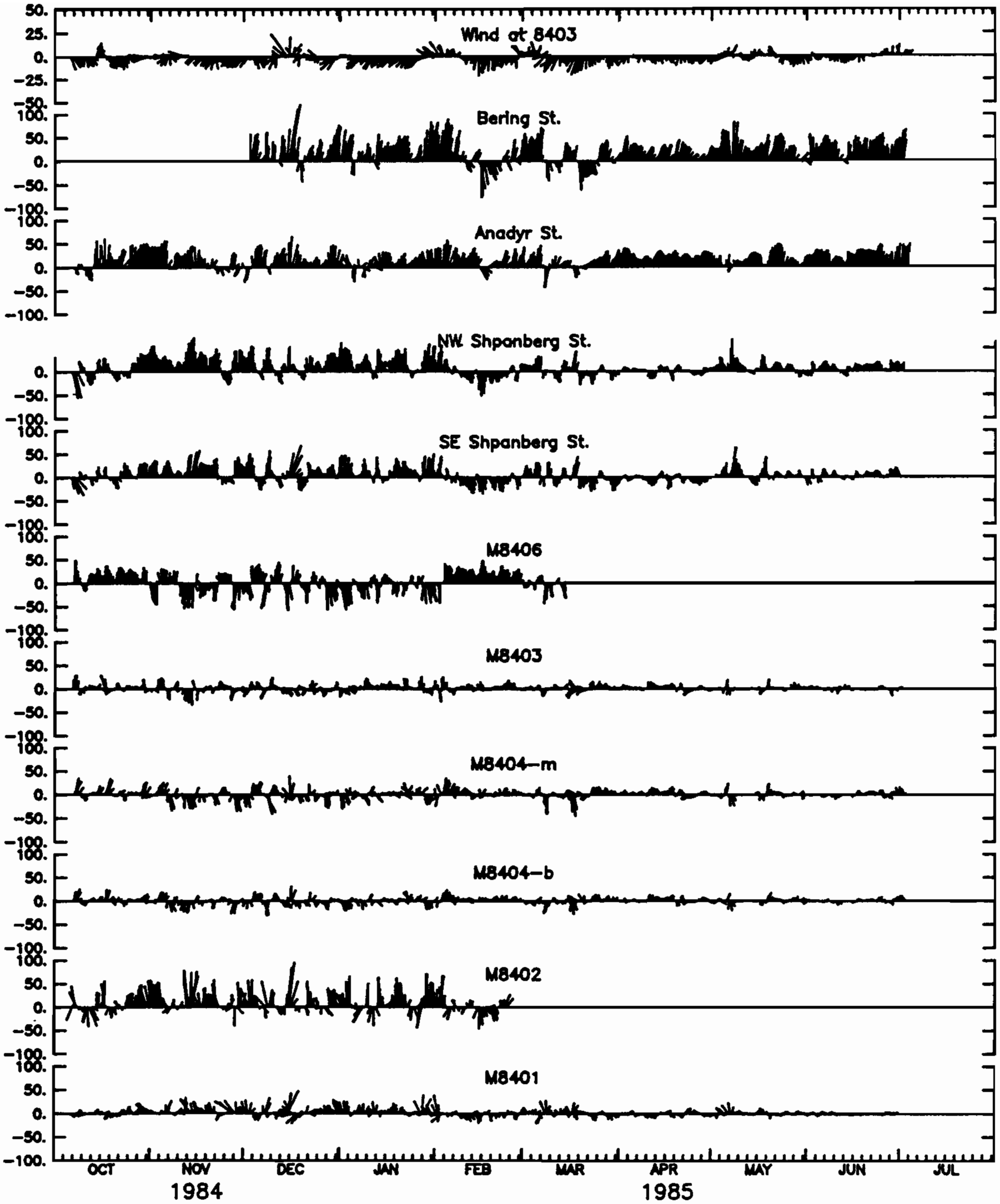


Figure 3b: Stick vectors of 35-hr filtered currents at bottom meters, rectified on their principal axes.

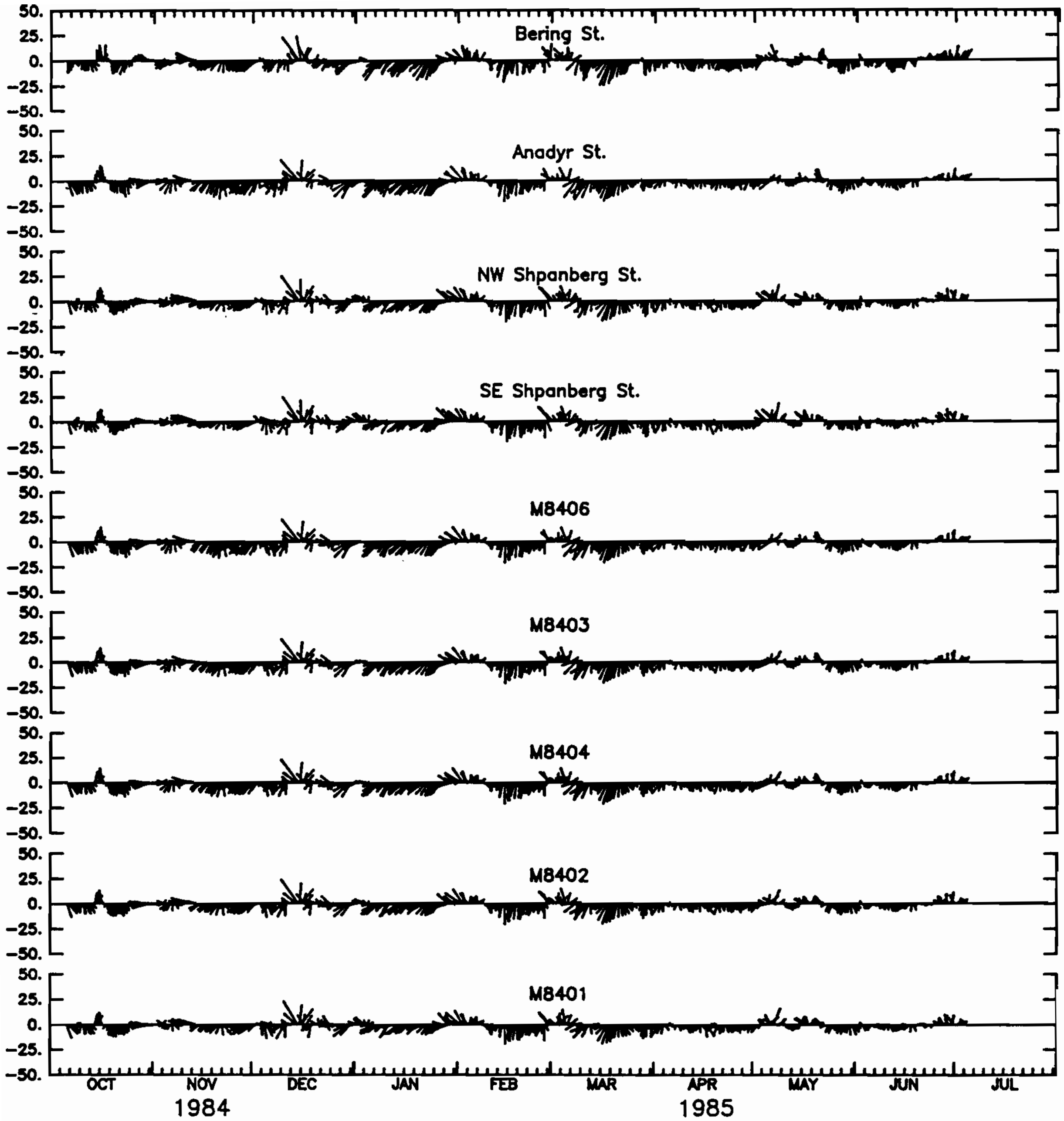
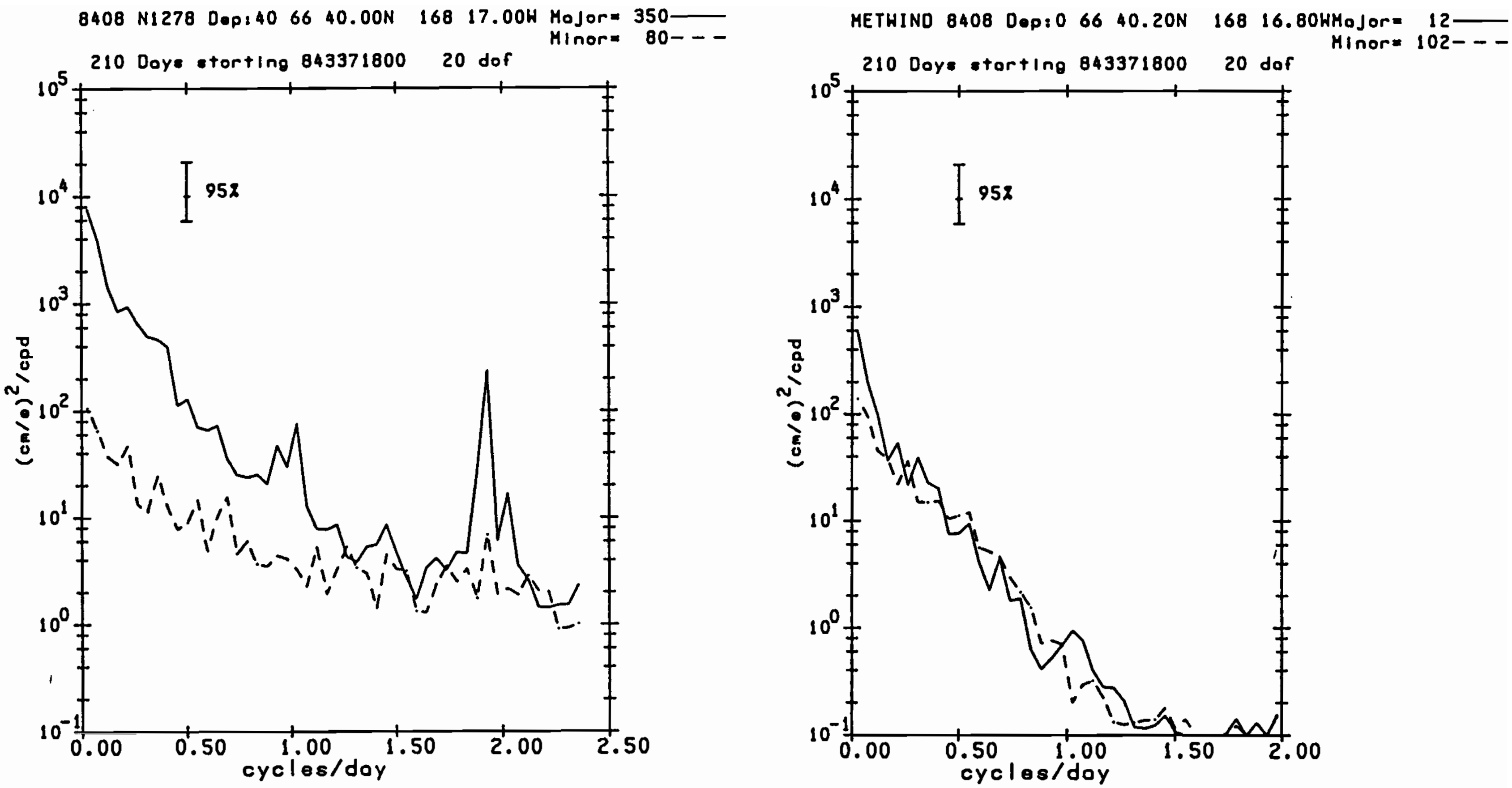


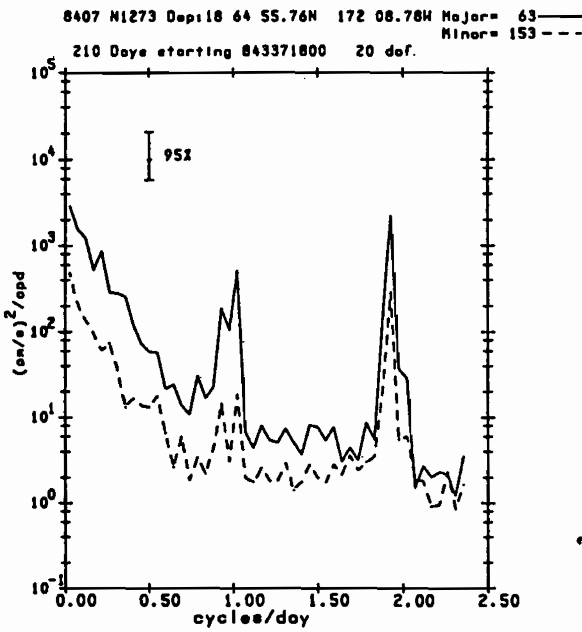
Figure 3c: METLIB wind at all mooring sites.



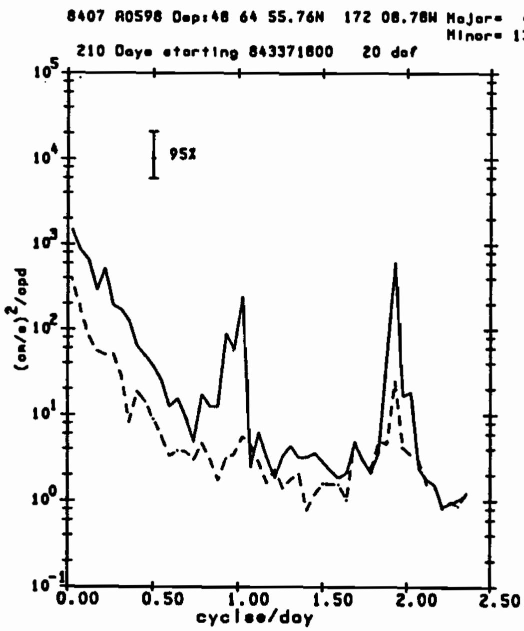
Total Var.	869.70
Var. > 10 d.	550.64(63.31%)
Var. 2-10 d.	264.38(30.40%)
Var. 2-5 d.	152.26(17.51%)
Tidal Var.	20.25(2.33%)
Di/Semi	0.60

Total Var.	76.71
Var. > 10 d.	47.92(62.46%)
Var. 2-10 d.	24.78(32.31%)
Var. 2-5 d.	14.10(18.38%)

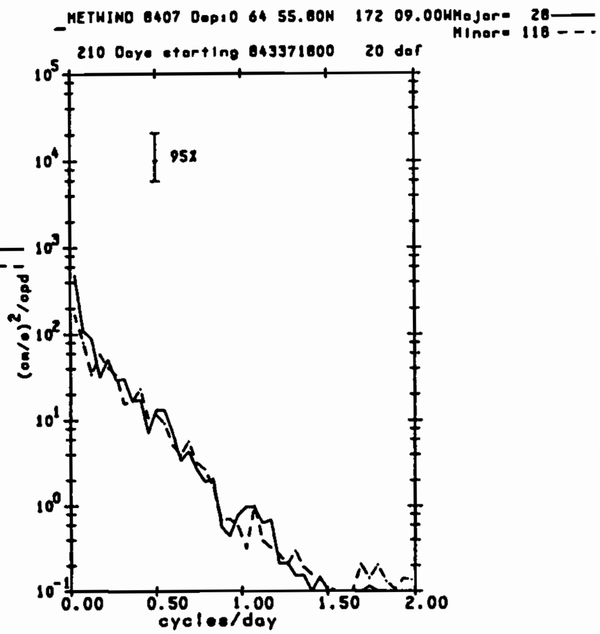
Figure 4a: Spectra, rectified on the principal axes, of the current and wind at Bering Strait.



Total Var.	628.09
Var. > 10 d.	243.41(38.75%)
Var. 2-10 d.	195.21(31.08%)
Var. 2-5 d.	100.71(16.04%)
Tidal Var.	164.20(26.14%)
Di/Semi	0.32

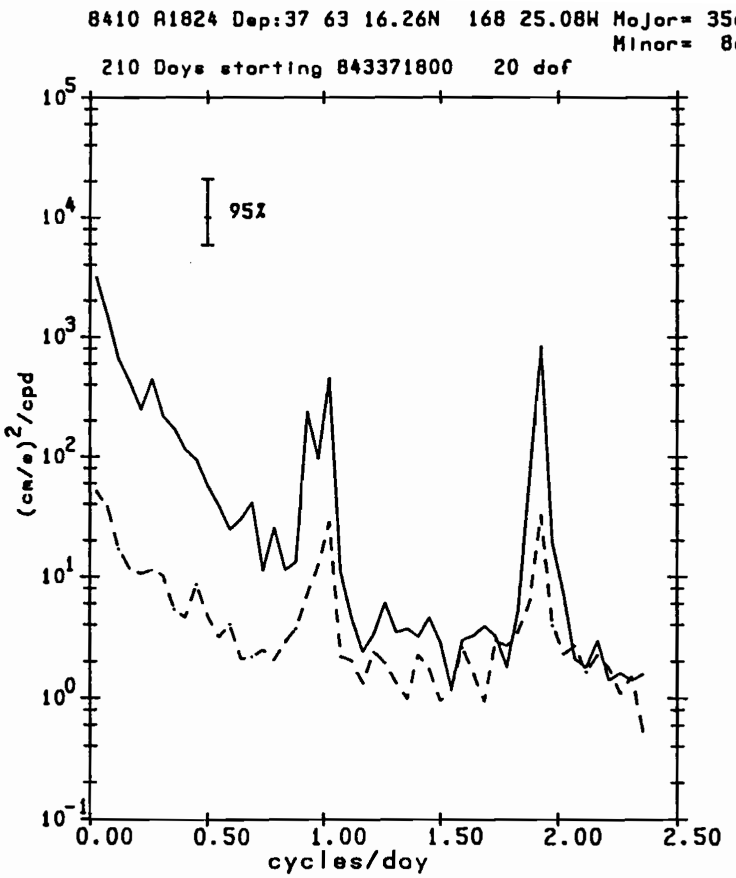


Total Var.	319.52
Var. > 10 d.	135.78(42.50%)
Var. 2-10 d.	113.00(35.36%)
Var. 2-5 d.	61.83(19.35%)
Tidal Var.	54.07(10.94%)
Di/Semi	0.55

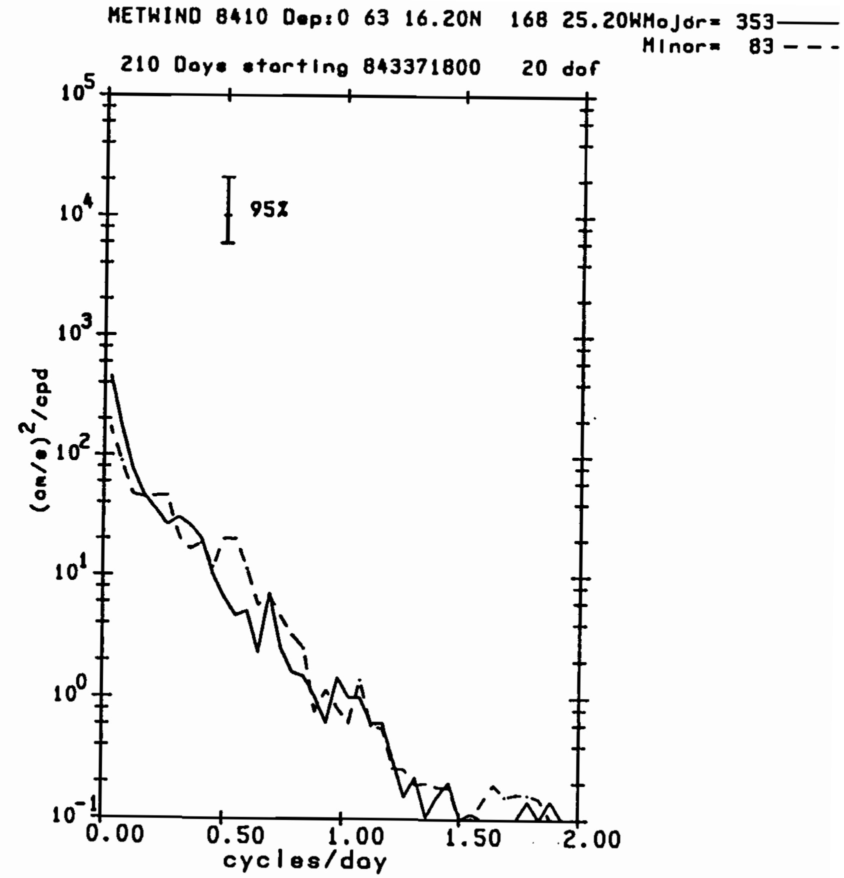


Total Var.	69.78
Var. > 10 d.	40.03(57.36%)
Var. 2-10 d.	25.09(35.96%)
Var. 2-5 d.	14.67(21.02%)

Figure 4b: Spectra, rectified on the principal axes, of the current and wind at Anadyr Strait.

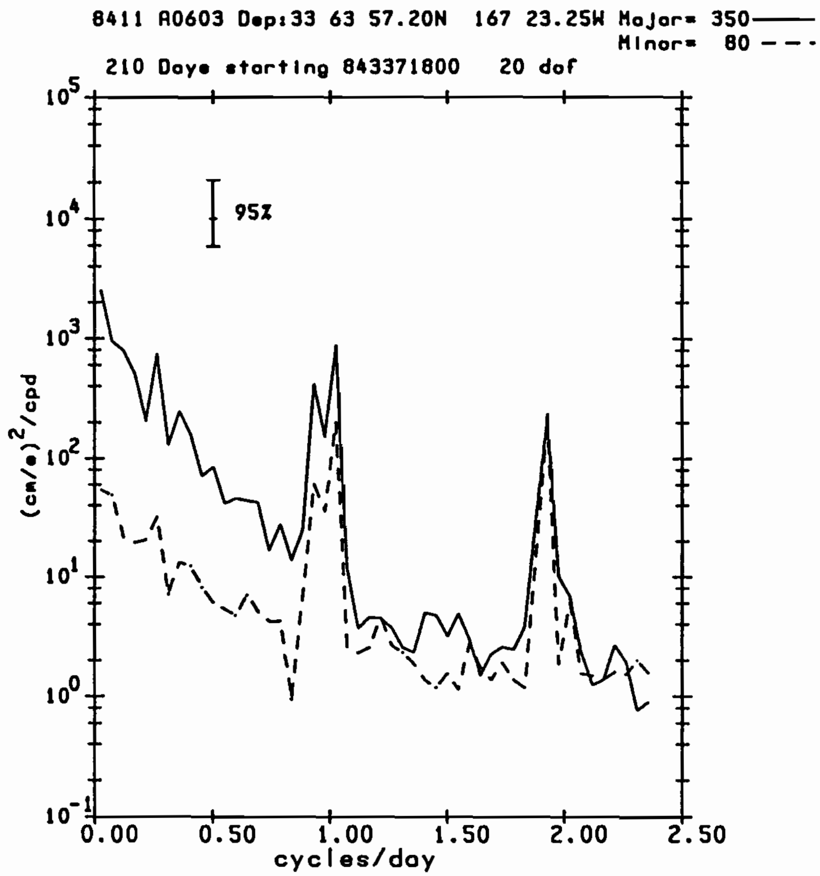


Total Var.	448.74
Var. > 10 d.	223.08(49.71%)
Var. 2-10 d.	117.06(26.09%)
Var. 2-5 d.	65.26(14.54%)
Tidal Var.	87.45(19.49%)
Di/Semi	0.85

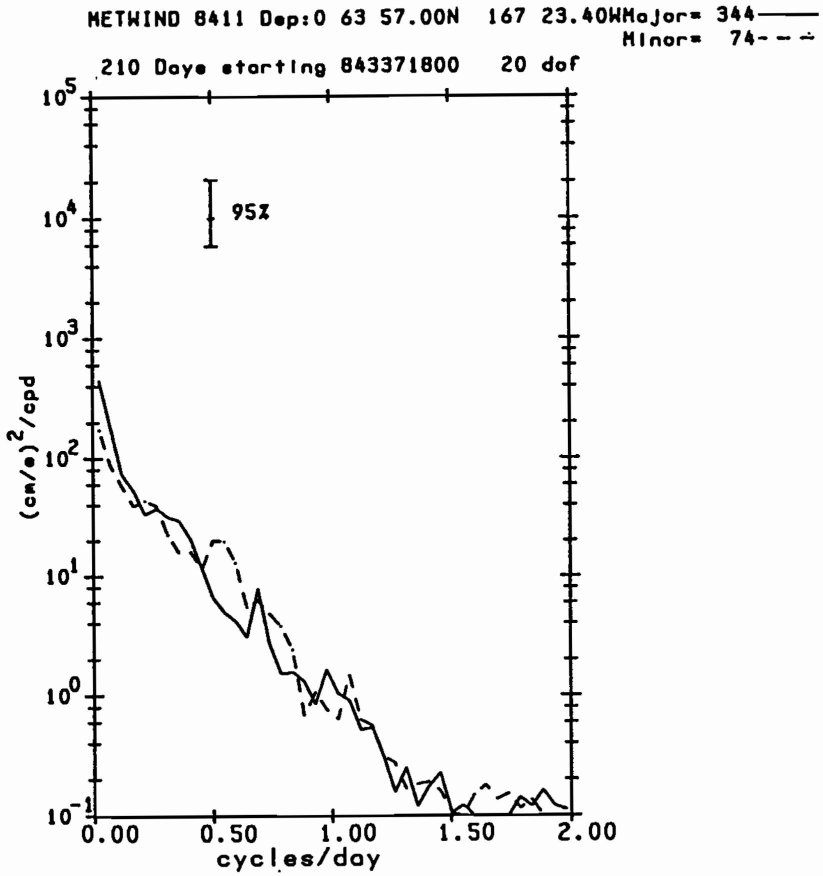


Total Var.	73.50
Var. > 10 d.	41.60(56.60%)
Var. 2-10 d.	26.43(35.95%)
Var. 2-5 d.	15.56(21.17%)

Figure 4c: Spectra, rectified on the principal axes, of the current and wind at 8410, in Shpanberg Strait.

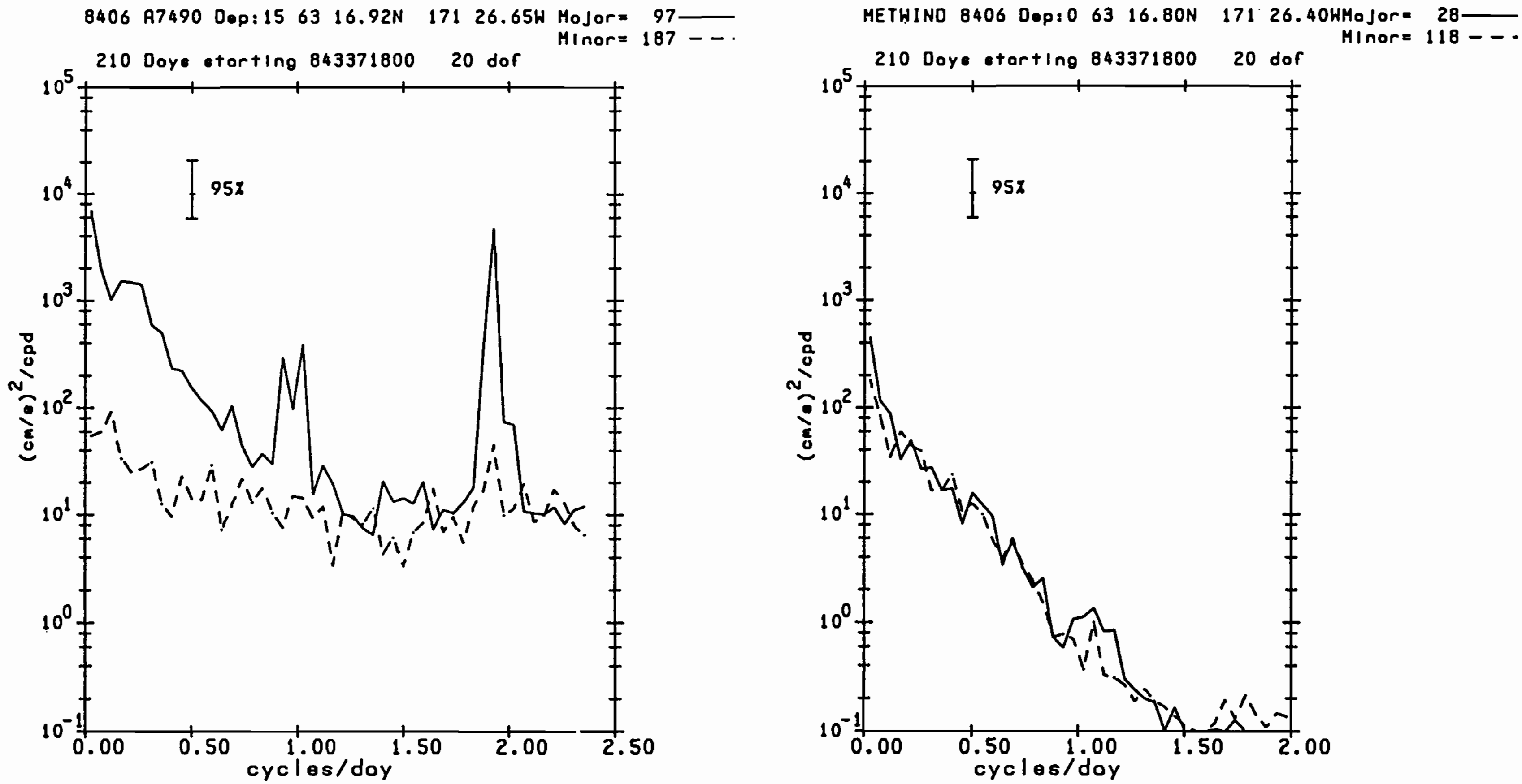


Total Var.	445.76
Var. > 10 d.	168.75(37.86%)
Var. 2-10 d.	144.06(32.32%)
Var. 2-5 d.	80.51(18.06%)
Tidal Var.	107.12(24.03%)
Di/Semi	3.65



Total Var.	74.37
Var. > 10 d.	41.67(56.02%)
Var. 2-10 d.	27.08(36.42%)
Var. 2-5 d.	15.76(21.19%)

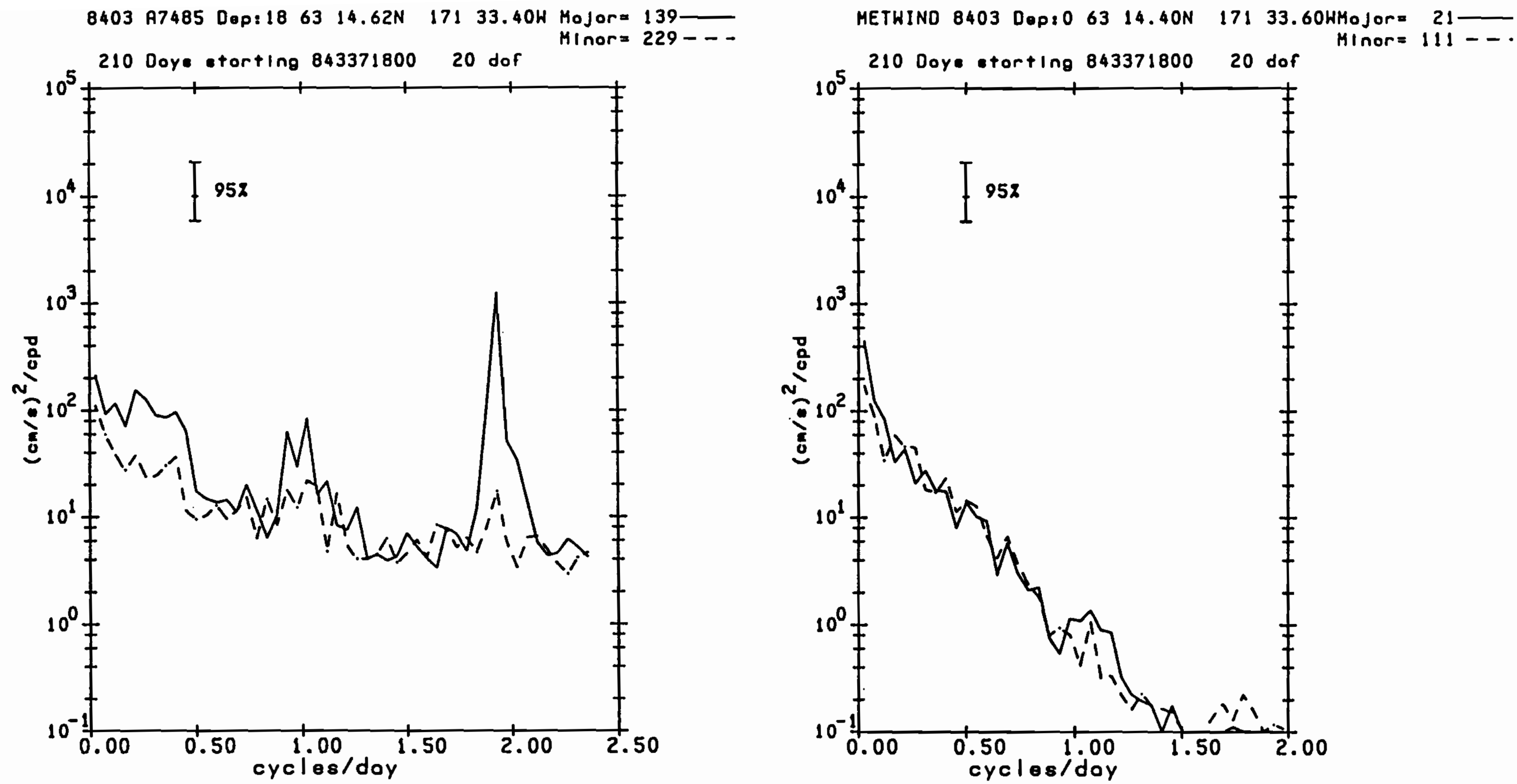
Figure 4d: Spectra, rectified on the principal axes, of the current and wind at 8411, in Shpanberg Strait.



Total Var.	1148.29
Var. > 10 d.	423.48(36.88%)
Var. 2-10 d.	346.37(30.16%)
Var. 2-5 d.	220.09(19.17%)
Tidal Var.	294.95(25.69%)
Di/Semi	0.15

Total Var.	69.87
Var. > 10 d.	39.20(56.10%)
Var. 2-10 d.	25.54(36.56%)
Var. 2-5 d.	14.94(21.38%)

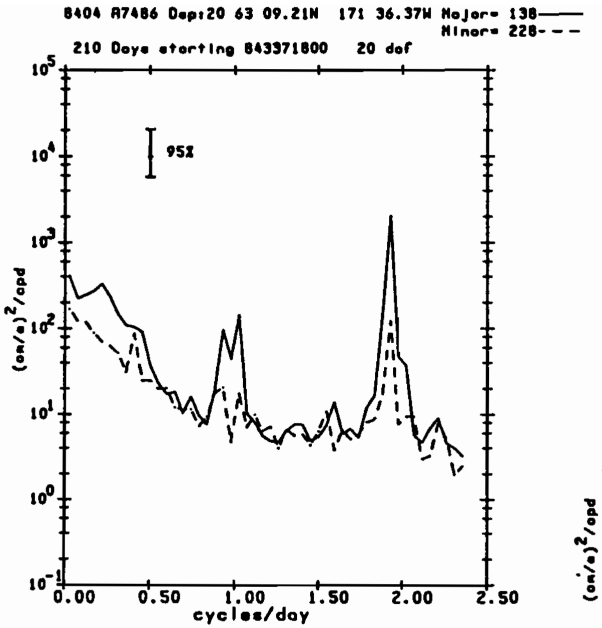
Figure 4e: Spectra, rectified on the principal axes, of the current and wind at 8406, south of St. Lawrence Island.



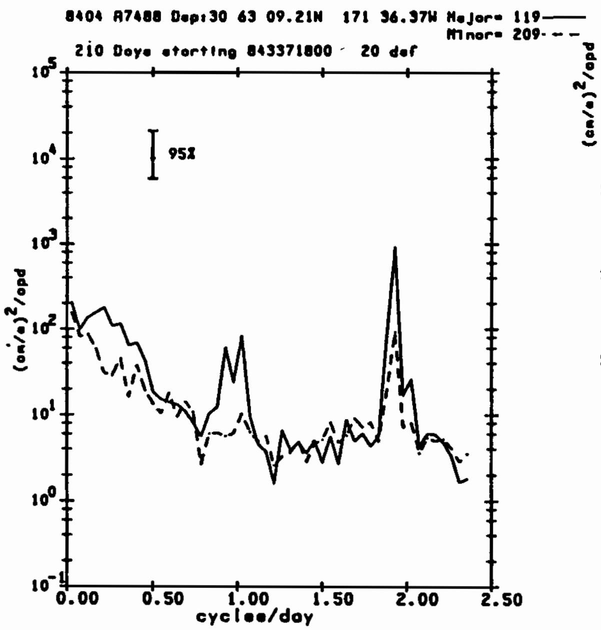
Total Var.	191.36
Var. > 10 d.	22.43(11.72%)
Var. 2-10 d.	49.56(25.90%)
Var. 2-5 d.	37.62(19.66%)
Tidal Var.	79.99(41.80%)
Di/Semi	0.15

Total Var.	70.28
Var. > 10 d.	39.58(56.31%)
Var. 2-10 d.	25.46(36.22%)
Var. 2-5 d.	14.95(21.27%)

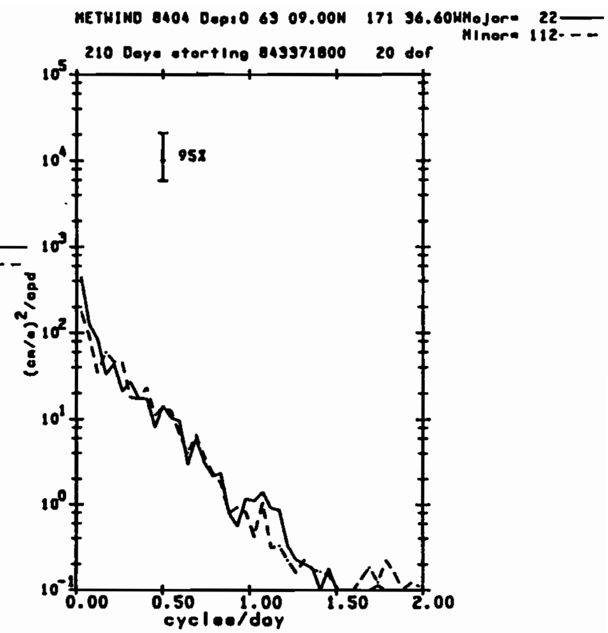
Figure 4f: Spectra, rectified on the principal axes, of the current and wind at 8403, south of St. Lawrence Island.



Total Var.	317.62
Var. > 10 d.	43.72(13.76%)
Var. 2-10 d.	99.36(31.28%)
Var. 2-5 d.	64.99(20.46%)
Tidal Var.	133.59(42.06%)
Di/Semi	0.13

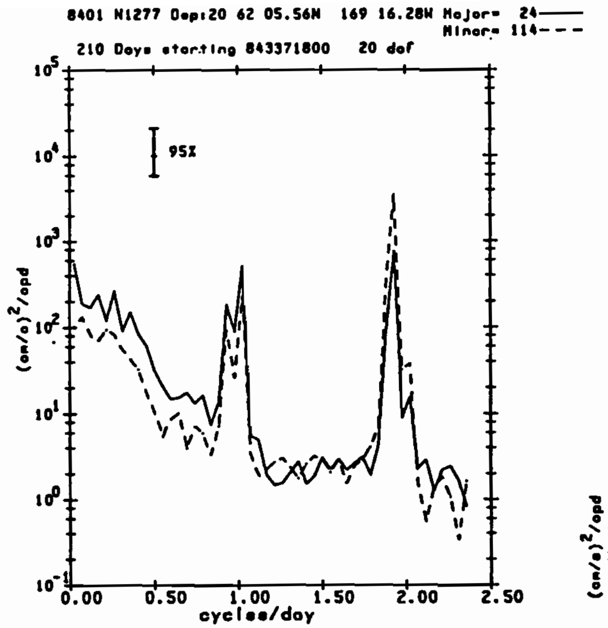


Total Var.	176.62
Var. > 10 d.	25.66(14.62%)
Var. 2-10 d.	57.39(32.70%)
Var. 2-5 d.	36.57(20.84%)
Tidal Var.	64.22(36.60%)
Di/Semi	0.16

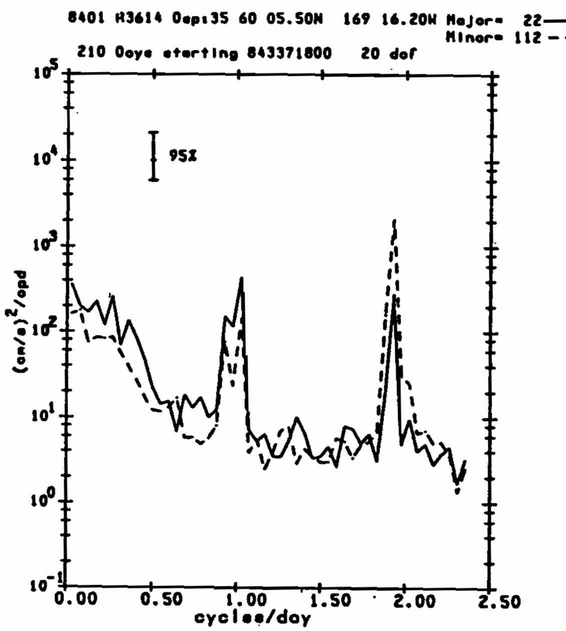


Total Var.	70.16
Var. > 10 d.	39.38(56.13%)
Var. 2-10 d.	25.50(36.35%)
Var. 2-5 d.	14.95(21.31%)

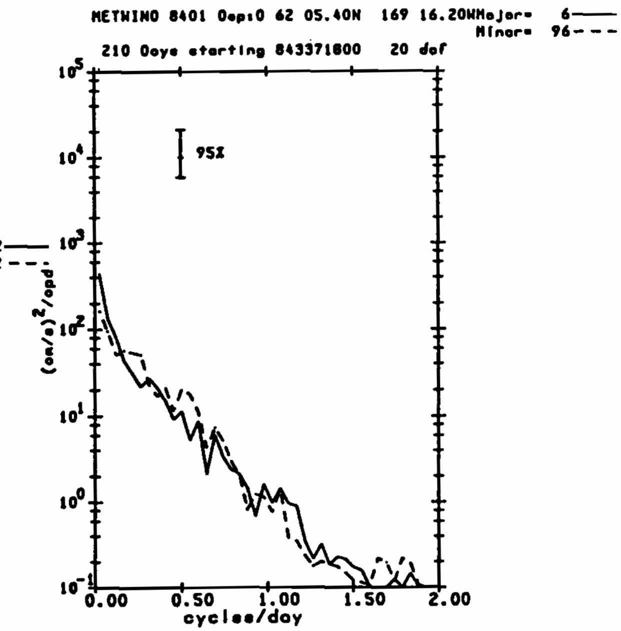
Figure 4g: Spectra, rectified on the principal axes, of the current and wind at 8404, south of St. Lawrence Island.



Total Var.	417.36
Var. > 10 d.	46.10(11.05%)
Var. 2-10 d.	79.61(19.08%)
Var. 2-5 d.	52.87(12.67%)
Tidal Var.	271.69(65.10%)
Di/Semi	0.24

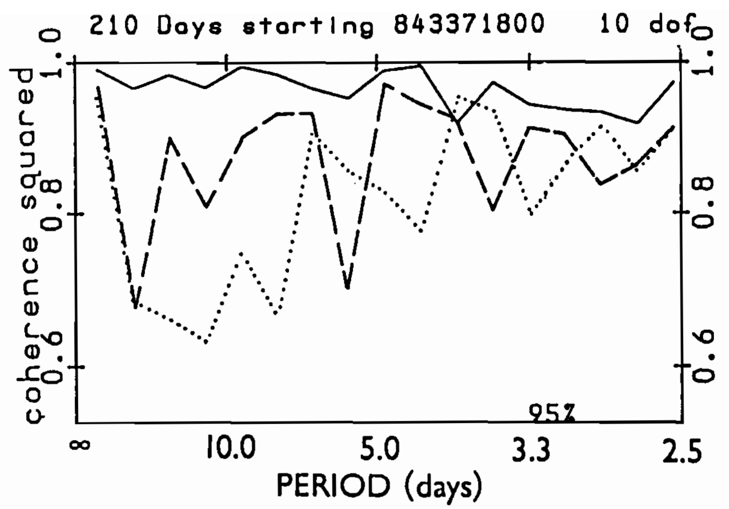


Total Var.	320.14
Var. > 10 d.	42.50(13.28%)
Var. 2-10 d.	75.64(23.63%)
Var. 2-5 d.	49.24(15.38%)
Tidal Var.	172.41(53.86%)
Di/Semi	0.36



Total Var.	71.72
Var. > 10 d.	39.02(54.40%)
Var. 2-10 d.	26.84(37.42%)
Var. 2-5 d.	15.15(21.12%)

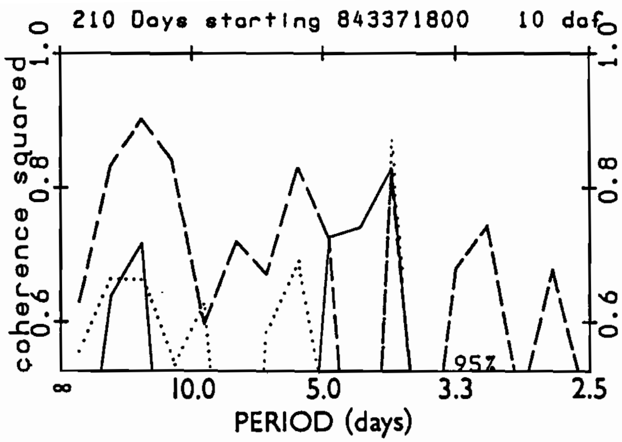
Figure 4h: Spectra, rectified on the principal axes, of the current and wind at 8401, south of St. Lawrence Island.



Vertical Coherences:

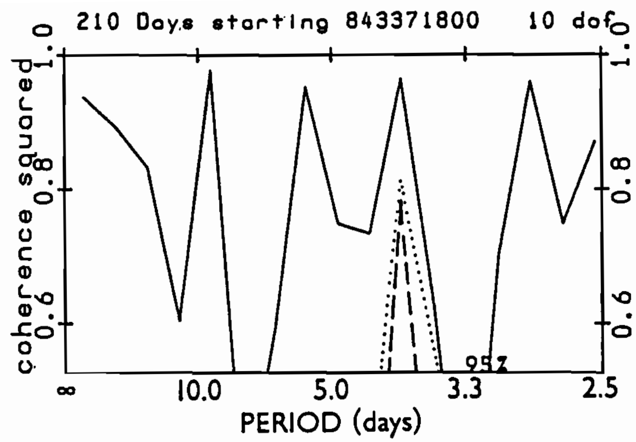
Period	8407____	8404----	8401....
70.00	.99>(-25)	.97>	.95>
26.25	.97>	.68	.68
16.15	.98>	.90	.66
11.67	.97	.81<	.63<
9.13	.99	.90(-13)	.75
7.50	.98	.93	.67<
6.36	.96<	.93>	.90(8)
5.53	.95<	.70<	.86
4.88	1.0<(2)	.97	.83<
4.38	.99(3)	.94	.78<
3.96	.92<	.93	.95>
3.62	.97<	.80<	.94<(5)
3.33	.94<	.91<	.80<(6)
3.09	.94<	.90	.87<
2.88	.93<	.84<	.92
2.69	.92<	.86<	.85<(4)
2.53	.97<<(3)	.91<	.91<

Figure 5a: Significant vertical coherence at periods greater than 60 hours. Currents were rectified on their principal axes. Data presented in the table are the coherence squared and the phase difference in hours. A positive lag means that the top (or first-listed) meter leads the bottom (or second-listed) meter. If no lag is given, it was not significantly different from 0°. A * indicates that the phase lag was not significantly different from ±180°. The symbols > and >> mean that more than 10% or 20% of the cross-variance was present at that period, while < and << indicate that less than 5% or 1% of the cross-variance was present.



8408 with:

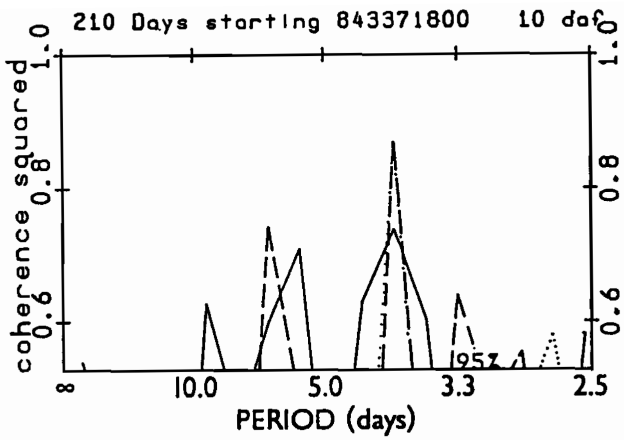
Period	8407____	8410----	8411....
70.00	----	.63>>	.55>>
26.25	.64>>	.83>>	.66>>
16.15	.72>	.90>	.66>
11.67	----	.84	.54
9.13	----	.60	.63
7.50	----	.72<	----
6.36	.53<	.67<	.59<
5.53	----	.84<	.69<
4.88	.73<	.73<	----
4.38	.74	----	----
3.96	.83<(32)	.84<	.88(-8)
3.62	----	----	----
3.33	----	.68<	----
3.09	----	.74<	----
2.88	----	----	----
2.69	----	.68<	----
2.53	----	----	----



Shpanberg and Anadyr Straits

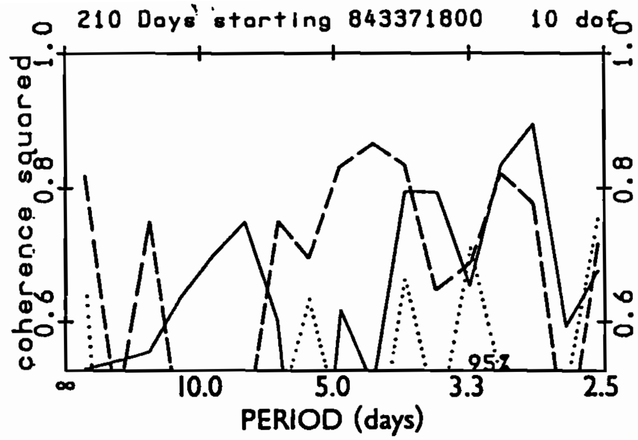
Period	8410-8411__	8407-8410--	8407-8411..
70.00	.94>>	----	----
26.25	.90>>	----	----
16.15	.82	----	----
11.67	.59	----	----
9.13	.97(9)	----	----
7.50	----	----	----
6.36	.60<	----	----
5.53	.95<	----	----
4.88	.75<	----	----
4.38	.73<<	----	----
3.96	.97(-3)	.79<(-35)	.81(-38)
3.62	.62<	----	.55<(-32)
3.33	----	----	----
3.09	.71<	----	----
2.88	.96<	----	----
2.69	.74<	----	----
2.53	.86<	----	----

Figure 5b: Significant coherence between meters in the straits. See figure 5a.



SSL with southern straits

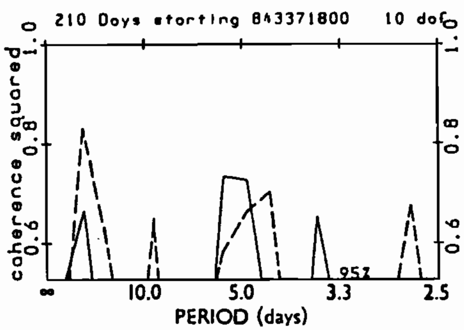
Period	8407-8404__	8410-8404--	8411-8404..
70.00	.54>	----	----
26.25	----	----	----
16.15	----	----	----
11.67	----	----	----
9.13	.63	----	----
7.50	----	----	----
6.36	.60	.74(47)	----
5.53	.71<(-12)	----	----
4.88	----	----	----
4.38	.63>	----	----
3.96	.74<	.88(41)	.85>*
3.62	.60<	----	----
3.33	----	.64<(31)	----
3.09	----	----	----
2.88	----	.55<*	----
2.69	----	----	.58<(21)
2.53	.58<	----	----



Stations South of St. Lawrence

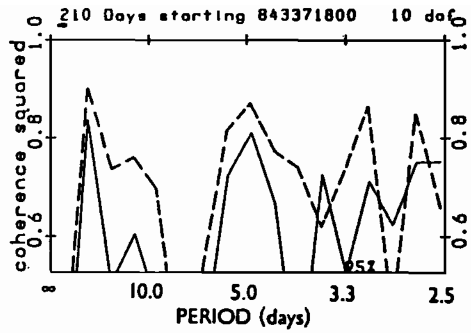
Period	8403-8404__	8406-8404--	8404-8401..
70.00	.53>	.82>>	.64>>*
26.25	.54	----	----
16.15	.56	.75	----
11.67	.64<(52)	----	----
9.13	.70	----	----
7.50	.75	----	----
6.36	.60	.75(-14)	----
5.53	----	.69<	.64(51)
4.88	.62	.83(-12)	----
4.38	----	.87<	----
3.96	.80	.84	.67>*
3.62	.79<(7)	.65<	----
3.33	.65<	.69<(-9)	.71<*
3.09	.84(7)	.82<(-9)	----
2.88	.90(4)	.78<	----
2.69	.59<	----	----
2.53	.68	.72<	.76*

Figure 5c: Significant coherence of meters south of St. Lawrence Island, with the straits and among themselves. See figure 5a.



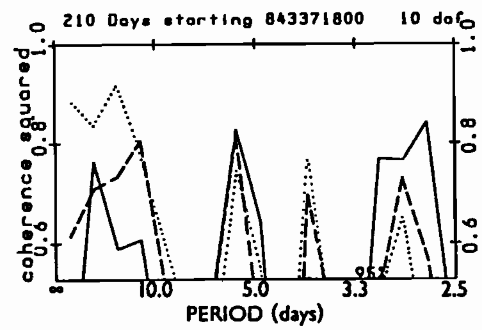
Wind at 8407

Period	W.axis 028____	W.axis 340----
70.00	----	----
26.25	.67>>>	.83>>>
16.15	----	.60>
11.67	----	----
9.13	----	.65
7.50	----	----
6.36	----	----
5.53	.73<	.58<
4.88	.73<	.66<
4.38	----	.70<(15)
3.96	----	----
3.62	.65<	----
3.33	----	----
3.09	----	----
2.88	----	----
2.69	----	.68<
2.53	----	----



Wind at 8408

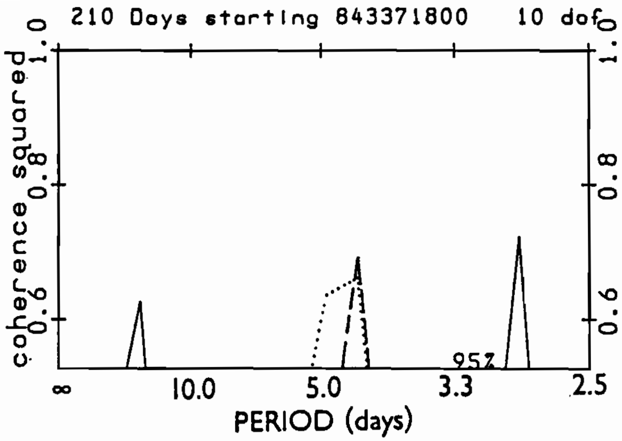
Period	W.axis 012____	W.axis 340----
70.00	----	----
26.25	.84>>>>	.90>>>
16.15	----	.73>
11.67	.60	.76
9.13	----	.69
7.50	----	----
6.36	----	.54<
5.53	.72<(19)	.82<(16)
4.88	.81<	.87<
4.38	.67<	.77<(15)
3.96	----	.74<(14)
3.62	.73<	.62<<
3.33	----	.73<
3.09	.71<(8)	.86<(6)
2.88	.62<	----
2.69	.75<(6)	.85<
2.53	.75<<	.65<<

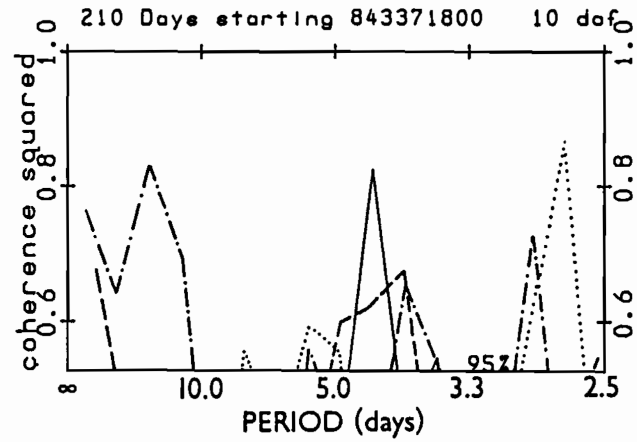


Wind at Shpanberg

Period	8410____ W.axis 353	8411---- W.axis 344	8411.... W.axis 310
70.00	----	----	.62>>
26.25	.76>>>	.77>>>	.71>>
16.15	.59>	.62>	.73
11.67	.61	.63	.81>
9.13	----	----	----
7.50	----	----	----
6.36	----	----	----
5.53	.83<(21)	.83<(21)	.81(18)
4.88	.64<	.67<	----
4.38	----	----	----
3.96	.53<(12)	.55<(12)	.70(10)
3.62	----	----	----
3.33	----	----	----
3.09	.77<(11)	.77<(11)	----
2.88	.76<(7)	.78<(8)	.73<(8)
2.69	.84<(6)	.86<(6)	.57<
2.53	----	----	----

Figure 5d: Significant coherence of METLIB winds with meters in the straits. Data for both the wind's principal and associated axes is presented. See figure 5a.





Wind at 8403 and 8404

Period	8403____ W.axis 300	8404---- W.axis 22	8404.... W.axis 50
70.00	----	----	----
26.25	----	----	----
16.15	.63>(133)	----	----
11.67	----	----	----
9.13	----	----	----
7.50	----	----	----
6.36	----	----	----
5.53	.53*	----	----
4.88	----	----	.64
4.38	----	.70(10)	.66
3.96	----	----	----
3.62	----	----	----
3.33	----	----	----
3.09	----	----	----
2.88	.72*	----	----
2.69	----	----	----
2.53	----	----	.56<(15)

Wind at 8406 and 8401

Period	8406____ W.axis 28	8406---- W.axis 90	8401.... W.axis 6	8401_._. W.axis 300
70.00	----	.76>>>	----	.77>>
26.25	----	----	----	.64>
16.15	----	----	----	.83>
11.67	----	----	----	.69<
9.13	----	----	----	----
7.50	----	----	.56<(28)	----
6.36	----	----	----	----
5.53	----	----	.59(16)	.56
4.88	----	.60	.55<(22)	----
4.38	.82>(45)	.62<(13)	----	----
3.96	----	.68(13)	----	.64
3.62	.55(26)	----	----	.54<(19)
3.33	----	----	----	----
3.09	----	----	----	----
2.88	----	----	.64<	.73<
2.69	----	----	.87<	----
2.53	----	.55<(10)	----	----

Figure 5e: Significant coherence of METLIB winds with meters south of St.Lawrence Island. See figure 5a.

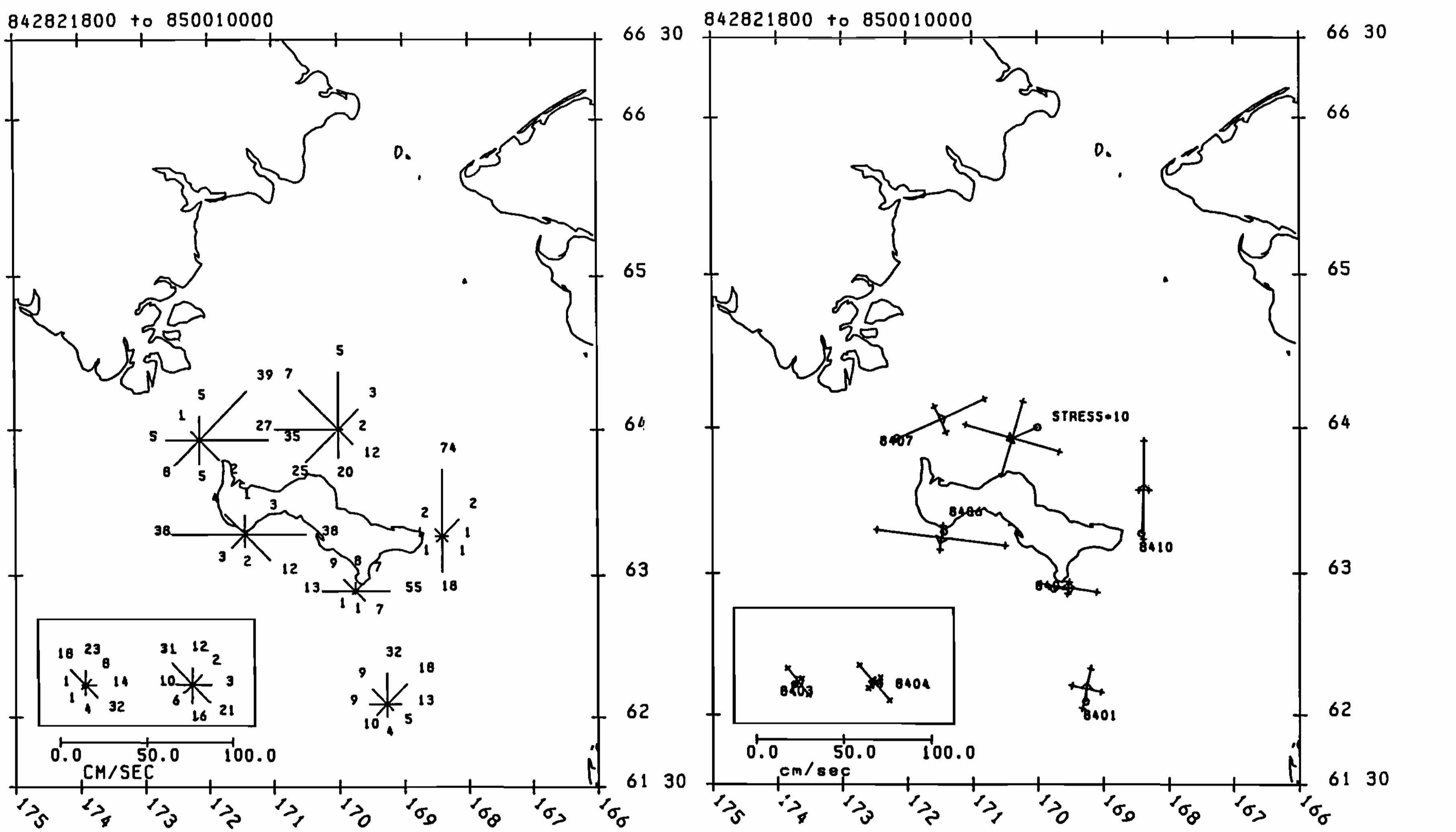


Figure 6a: Seasonal current roses and summary vectors for near-surface meters: first ninety days. In figures 6a and 6e, the roses and summary vectors in the box are from the top meters at 8403 and 8404.

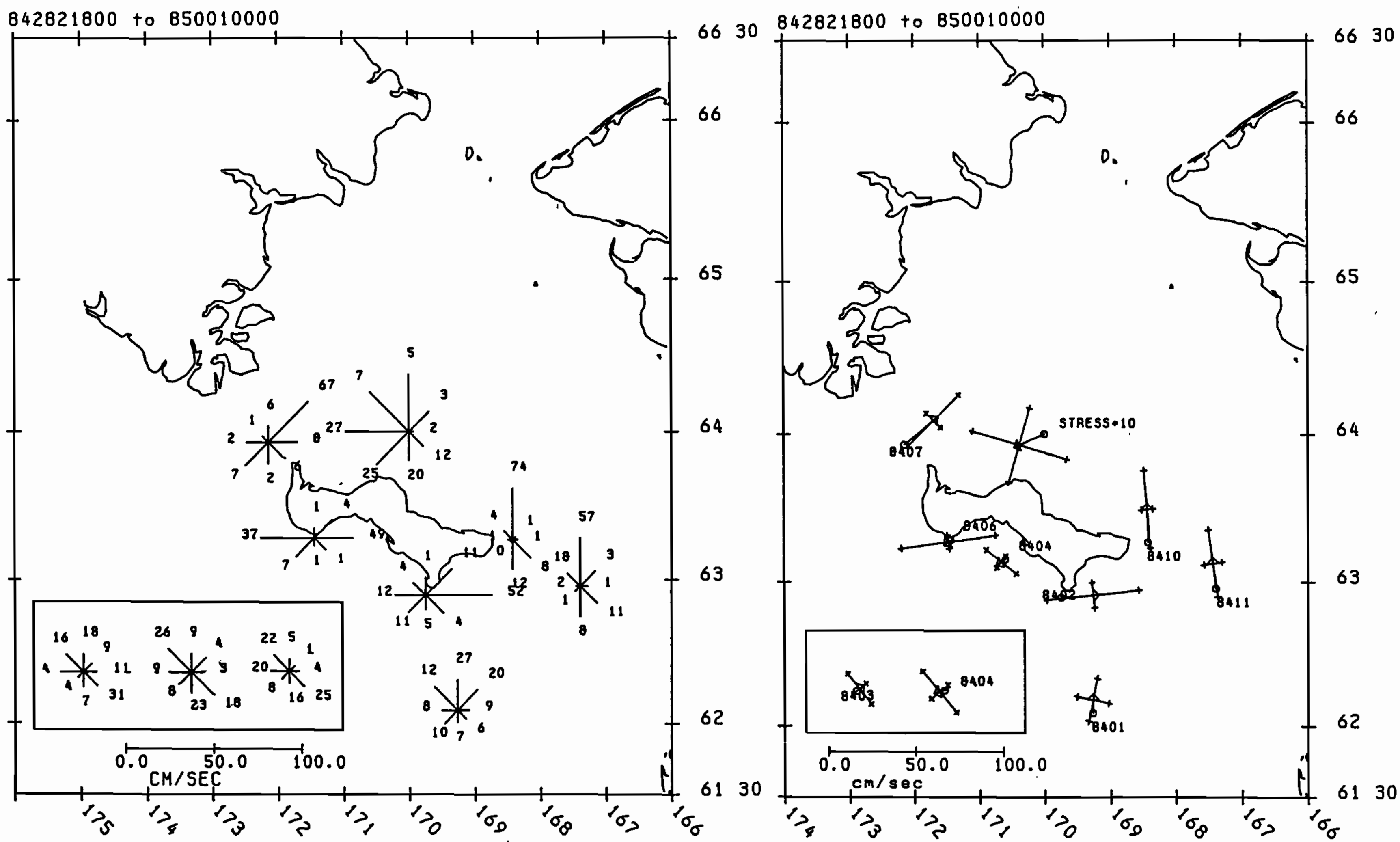


Figure 6b: Seasonal current roses and summary vectors for bottom meters: first ninety days. The current roses in the box are from,in order, 8403, the mid-depth 8404 meter, and the bottom meter at 8404.

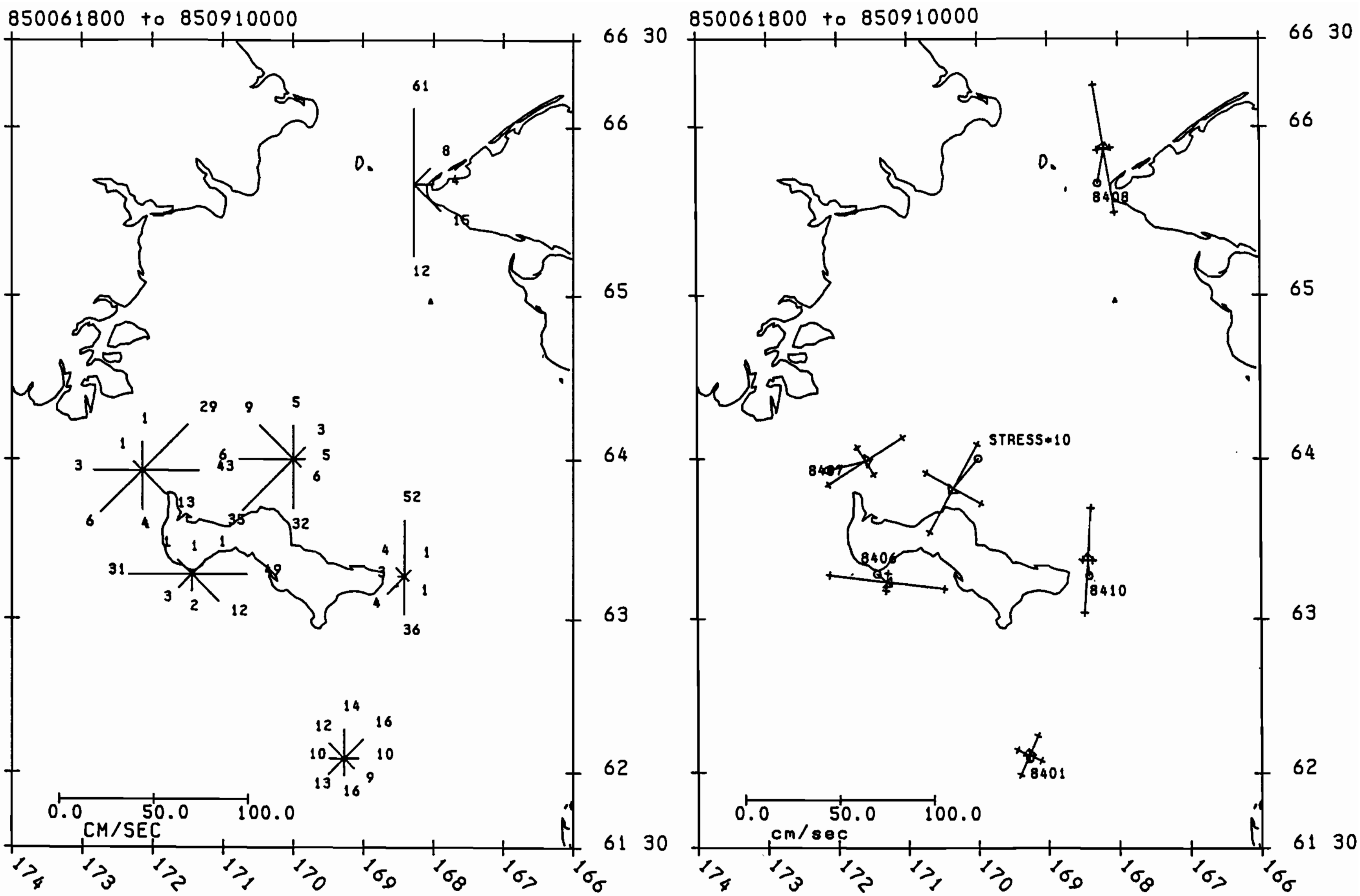


Figure 6c: Seasonal current roses and summary vectors for near-surface meters: second ninety days.

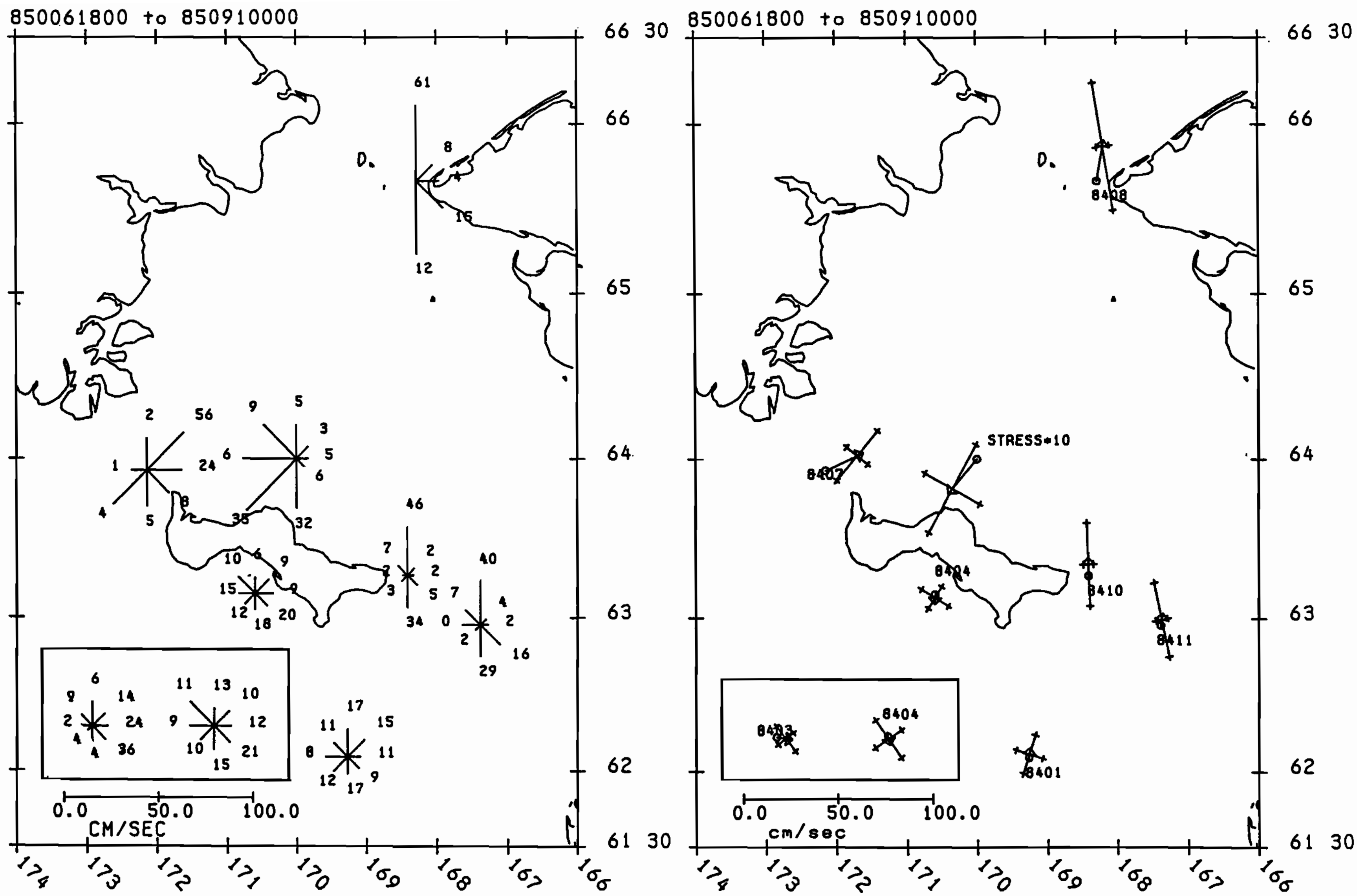


Figure 6d: Seasonal current roses and summary vectors for bottom meters: second ninety days. See figure 2b.

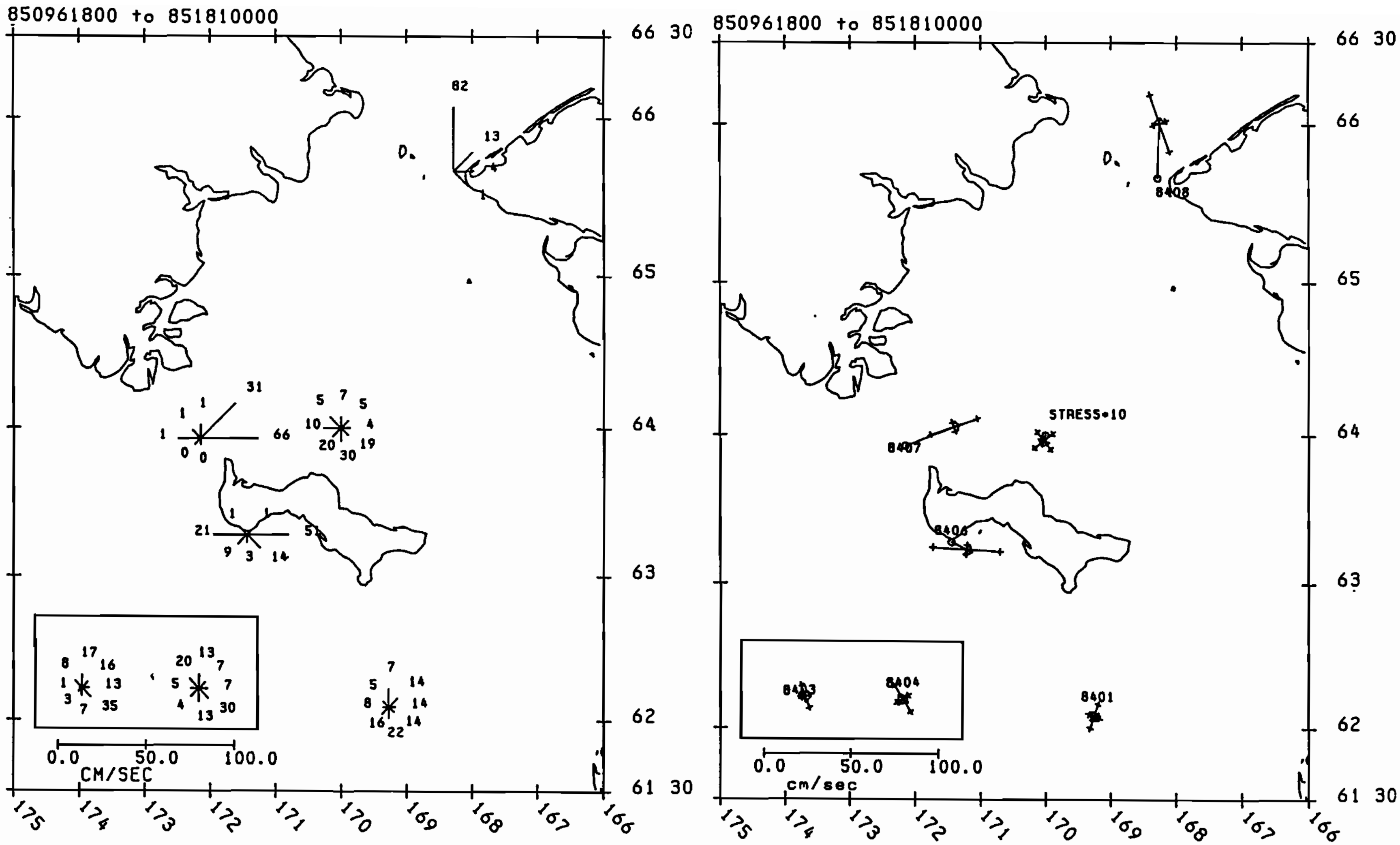


Figure 6e: Seasonal current roses and summary vectors for near-surface meters: third ninety days. See figure 6a.

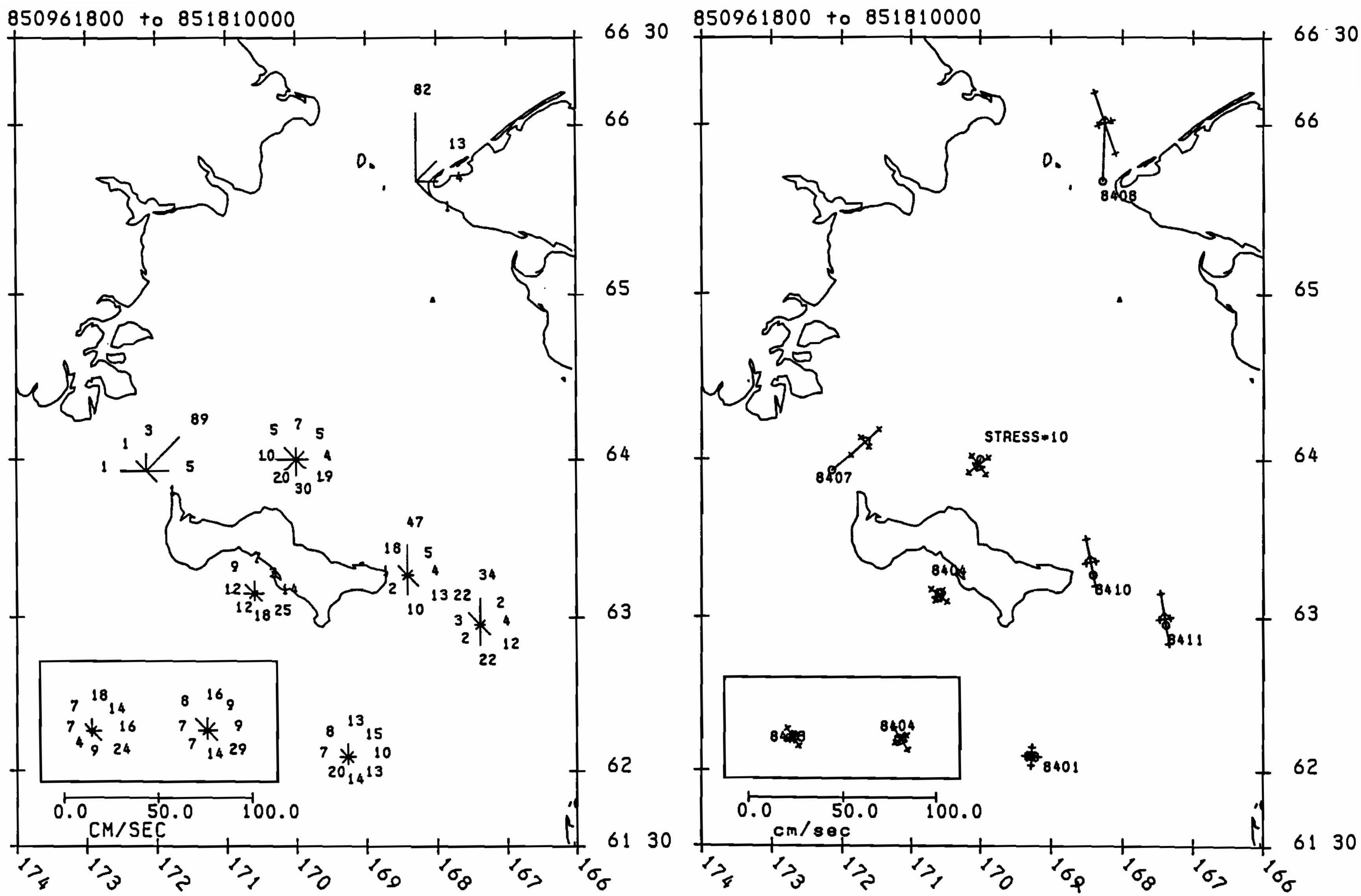


Figure 6f: Seasonal current roses and summary vectors for bottom meters: first third days. See figure 2b.

TABLES

Table 1: Deployment information on the APEX 85 moorings. The letter N before a current meter number signifies that the meter was a Neil Brown meter, and the letter A means that the meter was an Aanderaa meter. All Neil Brown meters took 10 min averaged data, while the Aanderaas recorded hourly data. The depth of water at mooring 8408 is uncertain, as the mooring was deployed via helicopter. Meters N1168 and N1169 malfunctioned for a period in January, as is shown below.

MOORING/METER	DEPTH METER	DEPTH WATER	LAT °N	LONG °W	FIRST RECORD (JD)	LAST RECORD (JD)	ICE COVER
Moorings in the Straits:							
8408/N1278	40	50	65.67	168.28	843342300	851861630	84318-85169
8407/N1273	18	58	63.93	172.15	842781000	851880340	84346-85162
8407/A0598	48	"	"	"	842781100	851880200	"
8410/N1276	22	42	63.27	168.42	842771600	851482040	84353-85169
8410/A1824	37	"	"	"	842771600	851851000	"
8411/A0603	33	38	62.9	167.39	842771200	851850600	84360-85169
Moorings south of St. Lawrence Island:							
8406/A7490	15	37	63.28	171.44	842780700	851870500	84346-85162
8406/A7491	30	"	"	"	842780700	850770300	"
8403/N1168	10	25	63.24	170.56	842772300	850152330	84346-85162
					850282200	851870430	
8403/A7485	18	"	"	"	842780100	851870400	"
8404/N1169	10	37	63.15	170.61	842780000	850161020	84346-85162
					850240300	851870510	"
8404/A7486	20	"	"	"	842780200	851870600	"
8404/A7488	30	"	"	"	842780300	851870500	"
8402/N1261	10	37	62.89	169.75	842771900	850800340	85001-85169
8402/A3185	30	"	"	"	842772300	850580100	"
8401/N1277	20	40	62.09	169.27	842770200	851842330	85015-85162*
8401/A3614	35	"	"	"	842770300	851850000	"

* 8401 was ice-covered intermittantly from 85015-85043

Table 2: Statistical data on currents and on METLIB winds. Currents are 35-hr filtered. Statistics were run for the pre-filtered period 843360000-851840000.

MOOR/MET	BATH AXIS °T	AXIS OF GRTST VAR	% OF VAR ON AXIS	VECTOR SPEED cm/s	MEAN DIR °T	SCALAR SPEED cm/s
8408 at 40 m	350	350.4	97.70	26.84 ± 3.87	03.5	34.3
8407 at 18 m	25	242.9	88.65	25.31 ± 2.76	69.2	29.8
8407 at 48 m	"	44.2	85.65	20.48 ± 1.88	54.6	23.9
8410 at 37 m	350	355.5	97.52	8.39 ± 2.80	356.2	16.0
8411 at 33 m	345	350.4	96.00	4.72 ± 2.28	358.5	14.7
8406 at 15 m	290	276.8	97.54	6.19 ± 3.38	126.0	25.0
8403 at 18 m	310	319.3	73.11	2.85 ± 0.60	89.0	7.5
8404 at 20 m	300	318.4	73.58	0.91 ± 1.02	160.5	9.8
8404 at 30 m	"	298.5	70.43	1.69 ± 0.57	200.0	7.8
8401 at 20 m	15	24.1	73.78	1.42 ± 1.16	14.1	8.9
8401 at 35 m	"	21.9	68.79	1.88 ± 1.00	2.8	8.7
			METLIB WINDS			
8408		11.9	68.53	5.29 ± 2.78	215.4	9.1
8407		28.4	61.59	5.41 ± 2.63	215.1	8.8
8410		353.1	58.49	4.18 ± 2.13	223.5	8.6
8411		343.9	59.83	3.69 ± 1.97	228.0	8.5
8406		28.1	59.02	5.01 ± 2.46	216.3	8.7
8403		20.7	57.70	4.79 ± 2.37	217.9	8.6
8404		21.6	57.56	4.75 ± 2.36	217.9	8.6
8402		10.6	56.35	4.36 ± 2.23	220.5	8.5
8401		5.8	55.21	3.68 ± 2.09	224.4	8.3

Table 3: Lagged Linear Correlations. Meters were correlated for the pre-filter period (84336-85184). To more easily understand the signs of the coefficients, currents were rectified on their axis of greatest variance or its inverse, whichever was northward or eastward. All coefficients listed are significant; comparisons which were not significant are indicated by ---. Data presented are the highest correlation coefficient of 0-4 lags, and the lag at which the highest correlation occurred. The data were 35-hr filtered; therefore 1 lag corresponds to 6 hours. Column lags row. Wind 1 refers to wind on its principal axis. Wind 2 is the wind on the axis which accounted for the highest percent variance of the current.

	8408 40 m	8407 18 m	8407 48 m	8410 37 m	8411 33 m	8406 15 m	8403 18 m	8404 20 m	8404 30 m	8401 20 m	8401 35 m
8408 at 40 m	^^^^^	0.54/0	0.52/0	0.77/0	0.66/0	-0.24/0	---/0	---/3	---/0	0.46/0	0.44/0
8407 at 18 m	0.54/1	^^^^^	0.98/0	--/4	---/0	0.39/0	---/4	0.49/0	0.44/0	-0.20/0	---/0
8407 at 48 m	0.52/0	0.98/0	^^^^^	---/4	---/0	0.39/0	---/4	0.49/0	0.46/0	-.21/0	-.16/0
8410 at 37 m	0.77/0	---/0	---/2	^^^^^	0.89/0	-0.64/0	-0.24/0	-0.33/0	-0.39/0	.76/0	.71/0
8411 at 33 m	0.66/0	---/0	---/0	0.89/0	^^^^^	-0.64/0	-0.22/0	-0.32/0	-0.37/0	.79/0	.77/0
8406 at 15 m	-0.27/2	0.39/0	0.39/0	-0.65/1	-0.67/1	^^^^^	0.41/0	0.70/0	0.67/0	-.71/0	-.66/0
8403 at 18 m	-0.16/1	---/3	0.15/3	-0.27/1	-0.26/2	0.47/1	^^^^^	0.68/1	0.66/1	-.38/0	-.37/0
8404 at 20 m	---/0	0.49/1	0.51/1	-0.36/1	-0.37/2	0.73/1	0.68/0	^^^^^	0.93/0	-.53/0	-.49/0
8404 at 30 m	---/3	0.44/1	0.47/1	-0.42/1	-0.42/2	0.71/1	0.65/0	0.93/0	^^^^^	-.55/0	-.48/0
8401 at 20 m	0.52/2	-0.21/1	-0.21/1	0.81/1	0.85/1	-0.73/1	-0.38/0	-0.53/0	-0.55/0	^^^^^	.90/0
8401 at 35 m	0.47/1	-0.17/1	-0.16/0	0.73/1	0.80/1	-0.66/0	-0.37/0	-0.49/0	-0.48/0	.90/0	^^^^^

Correlation with wind

	8408 40 m	8407 18 m	8407 48 m	8410 37 m	8411 33 m	8406 15 m	8403 18 m	8404 20 m	8404 30 m	8401 20 m	8401 35 m
Wind1	-.66/1	-.53/1	-.49/1	-.62/1	-.72/2	-.30/3	.20/4	-.23/2	---/2	-.38/0	-.34/0
Wind2	-.77/1	-.55/1	-.53/1	-.77/2	-.76/2	-.62/2	.31/0	-.36/1	-.30/1	-.66/1	.44/2

Table 4: Percent Associated Variance; % of Variance of Row associated with Column. Currents are 35-hr. filtered.

	8408 40 m	8407 18 m	8407 48 m	8410 37 m	8411 33 m	8406 15 m	8403 18 m	8404 20 m	8404 30 m	8401 20 m	8401 35 m
8408 at 40 m	^^^^^	39.94	37.08	72.77	53.09	3.53	5.73	2.64	4.03	18.88	1.98
8407 at 18 m	34.80	^^^^^	97.64	0.85	2.24	6.84	1.50	25.62	25.23	2.19	0.73
8407 at 48 m	32.62	97.62	^^^^^	0.86	2.60	5.61	10.92	24.70	26.23	1.61	0.00
8410 at 37 m	70.93	4.06	3.34	^^^^^	82.36	33.89	14.74	8.64	8.83	75.00	40.34
8411 at 33 m	53.05	9.00	7.77	84.01	^^^^^	35.73	11.10	11.48	8.48	81.05	65.07
8406 at 15 m	7.66	6.61	5.82	42.23	43.47	^^^^^	12.65	59.38	59.54	67.86	53.86
8403 at 18 m	6.33	4.84	6.97	12.55	11.17	18.56	^^^^^	60.28	53.39	11.33	13.74
8404 at 20 m	8.36	30.42	31.44	16.50	9.00	58.58	59.92	^^^^^	89.93	20.59	16.84
8404 at 30 m	11.23	30.42	32.74	17.23	6.69	54.82	48.83	89.72	^^^^^	30.14	23.79
8401 at 20 m	26.81	9.69	1.77	75.83	80.44	60.26	11.65	29.86	35.61	^^^^^	84.63
8401 at 35 m	10.18	9.22	0.00	48.75	66.09	44.67	14.56	22.51	31.50	83.84	^^^^^

Table 5. Percent Variance of Currents Associated with the Wind. Data presented are the percent variance of the current (on its principal axis) associated with the wind, the wind axis for the comparison, and the wind variance on the axis given. Data are shown for two wind axes: the principal axis of the wind (to the nearest 10°), and the axis on which the greatest associated variance occurred. Note that it isn't possible to distinguish between an axis and the axis with the same direction but the opposite sense. That is, for example, a wind axis listed as 120° could actually be 300°. The first part of the table is for the pre-filtered period 84336-85184. The second part of the table presents seasonal data for selected meters.

	Axis of Greatest Wind Variance	Highest % Variance Assoc. with the wind
8408 at 40 m	41.28% at 190° (51.87)	63.52% at 160° (44.52)
8407 at 18 m	20.48% at 200° (41.57)	40.62% at 160° (34.88)
8407 at 48 m	19.67% at 200° (41.57)	36.63% at 180° (39.94)
8410 at 37 m	36.20% at 170° (43.16)	73.57% at 120° (30.85)
8411 at 33 m	50.43% at 170° (44.29)	68.40% at 130° (36.50)
8406 at 15 m	2.35% at 200° (39.72)	36.82% at 270° (25.93)
8403 at 18 m	0.00% at 190° (39.91)	8.45% at 120° (26.74)
8404 at 20 m	3.92% at 190° (39.66)	19.64% at 230° (33.54)
8404 at 30 m	6.78% at 190° (39.66)	18.01% at 240° (30.99)
8401 at 20 m	13.36% at 180° (39.44)	47.35% at 120° (29.20)
8401 at 35 m	5.96% at 180° (39.44)	27.22% at 270° (25.88)
**		
8408 at 40 m		
280-004	-----------------	-------------------
004-094	64.18% at 190°(72.63)	79.89% at 150°(47.35)
094-184	71.73% at 170°(28.10)	75.59% at 140°(23.95)
8407 at 18 m		
280-004	46.98% at 150°(54.17)	52.53% at 170°(53.31)
004-094	56.70% at 200°(58.58)	57.16% at 190°(57.89)
094-184	12.55% at 160°(16.77)	30.49% at 190°(15.90)
8410 at 37 m		
280-004	78.28% at 120°(43.43)	79.77% at 110°(43.17)
004-094	18.82% at 180°(54.90)	69.65% at 120°(28.96)
094-184	76.26% at 150°(26.91)	78.58% at 130°(24.59)
8404 at 20 m		
280-004	0.00% at 140°(48.62)	30.54% at 230°(39.37)
004-094	7.71% at 200°(54.46)	25.20% at 250°(31.44)
094-184	14.49% at 150°(18.05)	17.59% at 110°(14.99)
8401 at 20 m		
280-004	70.04% at 120°(43.64)	72.41% at 110°(43.49)
004-094	4.57% at 190°(49.91)	38.35% at 120°(26.16)
094-184	18.66% at 150°(22.66)	29.93% at 130°(21.49)

Table 6: Seasonal Variation of Kinetic Energy Distributions and Net and Mean Currents and Winds. Currents were 35-hr filtered before determining their mean and net values. Time periods given are pre-filtering times.

	CURRENTS			WINDS		
	84280-85004	85004-85094	85094-84184	84280-85004	85004-85094	85094-84184
8408 at 40 m						
Total KE	------------	1174.85	333.01	84.63	101.28	41.31
KE > 10 d.	------------	785.68(66.88%)	179.97(54.04%)	48.25(57.02%)	66.99(66.14%)	24.88(60.22%)
KE 2-10 d.	------------	331.74(28.24%)	113.06(33.95%)	33.03(39.03%	29.97(29.59%)	13.50(32.68%)
KE 2-5 d.	------------	220.95(18.81%)	63.34(19.02%)	15.20(17.96%)	19.53(19.28%)	7.63(18.47%)
Tidal KE	------------	19.07(1.62%)	18.74(5.63%)			
Di/Semi	------------	0.36	0.55			
Net cur.	------------	18.55 ± 7.79 at 9.9	31.02 ± 8.90 at 2.2	6.28 ± 1.37 at 241.4	7.45 ± 2.30 at 212.9	3.51 ± 1.35 at 200.4
Mean cur.	------------	33.3	32.5	10.0	11.0	6.8
8407 at 18 m						
Total KE.	1036.32	779.51	415.86	104.97	89.23	32.67
KE > 10 d.	407.48(39.32%)	320.13(41.07%)	116.51(28.02%)	59.72(56.90%)	55.40(62.09%)	14.56(44.55%)
KE 2-10 d.	392.54(37.88%)	286.43(40.71%)	86.35(20.76%)	41.28(39.33%)	28.75(32.22%)	14.64(44.81%)
KE 2-5 d.	199.16(19.22%)	151.17(22.19%)	31.83(7.65%)	19.88(18.94%)	19.91(22.31%)	8.19(25.07%)
Tidal KE	198.14(19.12%)	144.15(13.06%)	190.66(45.85%)			
Di/Semi	0.25	0.29	0.29			
Net Current	24.60 ± 5.77 at 66.3	20.60 ± 4.63 at 76.5	29.49 ± 2.66 at 68.8	6.62 ± 1.45 at 225.9	7.84 ± 2.03 at 214.9	3.34 ± 0.97 at 192.3
Mean Cur.	33.2	28.6	30.1	11.2	10.9	6.1
8407 at 48 m						
Total KE.	503.47	411.32	169.24			
KE > 10d	199.23(39.57%)	168.55(40.98%)	66.10(39.06%)			
KE 2-10 d.	218.93(43.48%)	167.44(40.71%)	47.31(27.96%)			
KE 2-5 d.	114.43(22.73%)	91.28(22.19%)	18.14(10.72%)			
Tidal KE	59.71(11.86%)	53.71(13.06%)	46.01(27.19%)			
Di/Semi	0.54	0.39	0.66			
Net Current	21.40 ± 4.00 at 50.7	18.22 ± 2.98 at 64.7	23.01 ± 1.94 at 49.8			
Mean Cur.	26.3	23.8	23.7			

Table 6 (continued).

	CURRENTS			WINDS		
	84280-85004	85004-85094	85094-84184	84280-85004	85004-85094	85094-84184
8410 at 22 m	*******************	*******************	*******************	*******************	*******************	*******************
Total KE	1106.68	833.14	--------------	84.78	88.64	43.28
KE > 10 d.	462.56(41.80%)	398.49(47.83%)	--------------	41.91(47.75%)	55.39(62.49%)	20.52(47.42%)
KE 2-10 d.	387.27(34.99%)	228.32(27.41%)	--------------	42.31(48.21%)	27.54(31.06%)	18.13(41.88%)
KE 2-5 d.	115.75(10.46%)	158.98(19.08%)	--------------	19.69(22.43%)	18.52(20.89%)	11.52(26.63%)
Tidal KE	226.59(20.48%)	168.52(20.23%)	--------------			
Di/Semi	0.37	0.52	--------------			
Net Current	25.00 ± 6.06 at 3.0	8.06 ± 6.32 at 354.4	--------------	5.92 ± 1.24 at 247.5	6.49 ± 1.81 at 221.4	2.25 ± 1.13 at 194.3
Mean Cur.	36.4	25.7	--------------	9.9	10.5	6.3
8410 at 37 m	*******************	*******************	*******************	*******************	*******************	*******************
Total KE	652.48	522.08	253.05			
KE > 10 d	284.70(43.63%)	258.21(49.46%)	95.04(37.56%)			
KE 2-10 d.	228.28(34.99%)	151.90(29.10%)	67.35(26.62%)			
KE 2-5 d	69.95(10.72%)	107.26(20.55%)	39.10(15.45%)			
Tidal KE	111.84(17.14%)	82.71(15.84%)	78.79(31.14%)			
Di/Semi	0.49	0.85	0.87			
Net Current	18.74 ± 4.62 at 358.5	6.00 ± 5.00 at 359.3	6.74 ± 2.76 at 350.1			
Mean Cur.	24.9	18.5	11.2			
8411 at 33 m	*******************	*******************	*******************	*******************	*******************	*******************
Total KE	550.97	484.69	304.63	84.90	86.65	46.75
KE > 10 d.	145.38(26.39%)	183.38(37.83%)	95.88(31.48%)	38.61(45.48)	53.74(62.02%)	22.11(47.30%)
KE 2-10 d.	262.90(47.72%)	170.56(35.19%)	86.11(28.27%)	42.79(50.40)	26.99(31.15%)	19.89(42.54%)
KE 2-5 d.	71.56(12.99%)	130.18(26.86%)	49.00(16.08%)	19.60(23.09)	17.83(20.58%)	12.80(27.39%)
Tidal KE	112.11(20.35%)	97.44(20.10%)	105.93(34.77%)			
Di/Semi	2.73	3.37	4.48			
Net Cur.	14.26 ± 3.77 at 353.8	3.03 ± 4.31 at 8.5	3.32 ± 2.47 at 350.8	5.73 ± 1.28 at 254.6	5.96 ± 1.67 at 224.7	1.78 ± 1.13 at 194.5
Mean Cur.	20.4	17.1	10.3	9.6	10.2	6.4

Table 6 (continued).
STATIONS SOUTH OF ST. LAWRENCE

	CURRENTS			WINDS		
	84280-85004	85004-85094	85094-84184	84280-85004	85004-85094	85094-84184
8406 at 15 m	******************	******************	******************	******************	******************	******************
Total KE	1892.20	1291.08	675.96	102.24	87.60	34.14
KE > 10 d.	412.87(21.82%)	513.10(39.74%)	182.35(26.98%)	55.24(54.04%)	54.15(61.82%)	14.40(42.18%)
KE 2-10 d.	912.01(48.20%)	411.49(31.87%)	162.30(24.01%)	42.99(42.05%)	28.05(32.02%)	15.60(45.69%)
KE 2-5 d.	340.45(17.99%)	321.39(24.89%)	104.04(15.39%)	20.68(20.22%)	19.46(22.21%)	9.11(26.69%)
Tidal KE.	377.70(19.96%)	272.11(21.08%)	295.90(43.78%)			
Di/Semi	0.12	0.17	0.12			
Net Cur.	3.53 ± 1.84 at 202.4	6.64 ± 6.14 at 128.2	9.59 ± 3.09 at 115.7	6.22 ± 1.38 at 227.2	7.49 ± 1.96 at 216.4	3.01 ± 0.96 at 189.9
Mean Cur.	33.0	27.5	18.4	10.8	10.8	6.0
8406 at 30 m	******************	******************	******************	******************	******************	******************
Total KE	948.13	------------	------------			
KE > 10d	225.31(23.76%)	------------	------------			
KE 2-10 d	472.41(49.83%)	------------	------------			
KE 2-5 d.	177.37(18.71%)	------------	------------			
Tidal KE	185.69(19.59%)	------------	------------			
Di/Semi	0.13	------------	------------			
Net Cur.	1.34 ± 4.24 at 233.4	------------	------------			
Mean Cur.	23.8	------------	------------			
8403 at 10 m	******************	******************	******************	******************	******************	******************
Total KE	211.26	------------	142.33	96.81	87.64	35.89
KE > 10d.	26.55(12.57%)	------------	18.68(13.12%)	50.45(52.11%)	54.65(62.36%)	15.62(43.51%)
KE 2-10 d.	67.52(31.96%)	------------	27.69(19.45%)	42.52(43.92%)	27.53(31.42%)	15.94(44.41%)
KE 2-5 d.	47.67(22.56%)	------------	18.60(13.07%)	20.34(21.01%)	19.03(21.72%)	9.57(26.66%)
Tidal KE	95.75(45.32%)	------------	79.41(55.80%)			
Di/Semi	0.12	------------	0.11			
Net Cur.	2.55 ± 0.40 at 51.7	------------	2.32 ± 0.67 at 95.3	6.07 ± 1.30 at 232.4	7.23 ± 1.91 at 217.6	2.82 ± 1.03 at 190.5
Mean cur.	8.8	------------	6.0	10.4	10.7	6.1

Table 6 (continued).

	CURRENTS			WINDS		
	84280-85004	85004-85094	85094-84184	84280-85004	85004-85094	85094-84184
8403 at 18 m	******************	******************	******************	******************	******************	******************
Total KE	391.78	207.46	122.17.			
KE > 10d	31.73(8.10%)	22.65(10.92%)	10.58(8.66%)			
KE 2-10 d.	101.07(25.80%)	66.12(31.87%)	24.55(20.10%)			
KE 2-5 d.	73.88(18.86%)	50.96(24.57%)	18.19(14.89%)			
Tidal KE	152.49(38.92%)	80.10(38.61%)	67.81(55.50%)			
Di/Semi	0.14	0.16	0.12.			
Net cur.	1.91 ± 0.67 at 59.1	4.94 ± 1.08 at 98.0	1.74 ± 0.56 at 79.5			
Mean Cur.	10.2	9.1	4.9			
8404 at 10 m	******************	******************	******************	******************	******************	******************
Total KE	360.76	------------	251.52	96.95	87.22	35.86
KE > 10d.	36.54(10.13%)	------------	28.38(11.28%)	50.38(51.97%)	54.32(62.28%)	15.43(43.03%)
KE 2-10 d.	148.06(41.04%)	------------	49.15(19.54%)	42.72(44.06%)	27.44(31.45%)	16.04(44.74%)
KE 2-5 d.	87.92(24.37%)	------------	30.48(12.12%)	20.43(21.07%)	18.98(21.76%)	9.62(26.84%)
Tidal KE	149.93(41.56%)	------------	155.81(61.95%)			
Di/Semi	0.10	------------	0.10			
Net cur.	2.81 ± 1.83 at 282.1	------------	0.93 ± 1.38 at 128.5	6.01 ± 1.29 at 231.9	7.20 ± 1.91 at 217.7	2.79 ± 1.02 at 190.0
Mean cur.	11.9	------------	7.2	10.4	10.7	6.0
8404 at 20 m	******************	******************	******************	******************	******************	******************
Total KE	559.29	375.90	196.70			
KE > 10d	54.63(9.77%)	60.26(16.03%)	15.59(7.92%)			
KE 2-10 d.	194.22(34.73%)	134.95(35.90%)	39.55(20.10%)			
KE 2-5 d.	128.46(22.97%)	88.82(23.63%)	27.54(14.00%)			
Tidal KE	221.78(39.65%)	138.21(36.77%)	115.92(58.92%)			
Di/Semi	0.11	0.12	0.11			
Net cur.	2.93 ± 1.28 at 253.6	1.23 ± 1.75 at 166.6	1.45 ± 0.90 at 113.9			
Mean cur.	13.4	11.8	6.0			

Table 6 (continued).

	CURRENTS			WINDS		
	84280-85004	85004-85094	85094-84184	84280-85004	85004-85094	85094-84184
8404 at 30 m	******************	******************	******************	******************	******************	******************
Total KE	289.14	200.74	110.59			
KE > 10d.	22.14(7.66%)	34.32(17.10%)	8.65(7.82%)			
KE 2-10 d.	110.08(38.07%)	73.23(36.48%)	29.47(26.65%)			
KE 2-5 d.	72.78(25.17%)	47.93(23.88%)	19.27(17.43%)			
Tidal KE.	104.39(36.10%)	62.73(31.25%)	56.28(50.89%)			
Di/Semi	0.12	0.14	0.18			
Net cur.	2.65 ± 0.82 at 237.3	1.77 ± 1.14 at 183.1	1.21 ± 0.67 at 162.5			
Mean cur.	9.9	12.9	9.9			
8402 at 10 m	******************	******************	******************	******************	******************	******************
Total KE	946.53	-------------	-------------	91.49	86.41	38.90
KE > 10d.	103.85(10.97%)	-------------	-------------	44.93(49.11%)	53.90(62.37%)	16.91(43.48%)
KE 2-10 d.	155.90(16.47%)	-------------	-------------	42.88(46.86%)	26.90(31.13%)	17.29(44.46%)
KE 2-5 d.	78.96(8.34%)	-------------	-------------	20.30(22.18%)	18.44(21.34%)	10.65(27.38%)
Tidal KE.	634.18(67.00%)	-------------	-------------			
Di/Semi	0.11	-------------	-------------			
Net cur.	8.28 ± 2.67 at 86.6	-------------	-------------	5.71 ± 1.23 at 238.0	6.77 ± 1.84 at 219.7	2.43 ± 1.08 at 189.8
Mean cur.	15.3	-------------	-------------	10.0	10.5	6.1
8402 at 30 m	******************	******************	******************	******************	******************	******************
Total KE	630.64	-------------	-------------			
KE > 10d.	60.40(9.58%)	-------------	-------------			
KE 2-10 d.	119.00(18.87%)	-------------	-------------			
KE 2-5 d.	58.75(9.32%)	-------------	-------------			
Tidal KE.	392.35(62.22%)	-------------	-------------			
Di/Semi	0.12	-------------	-------------			
Net cur.	1.34 ± 4.24 at 233.4	-------------	-------------			
Mean cur.	23.8	-------------	-------------			

Table 6 (continued).

	CURRENTS			WINDS		
	84280-85004	85004-85094	85094-84184	84280-85004	85004-85094	85094-84184
8401 at 20 m	******	******	******	******	******	******
Total KE	492.43	414.83	392.82	86.80	83.08	42.55
KE > 10d.	87.74(17.82%)	50.29(12.12%)	23.51(5.99%)	39.24(45.21%)	51.64(62.16%)	17.59(41.33%)
KE 2-10 d.	116.31(23.62%)	111.54(26.89%)	35.74(9.10%)	43.99(50.68%)	25.57(30.77%)	19.65(46.19%)
KE 2-5 d.	53.87(10.94%)	89.08(21.47%)	23.07(5.87%)	20.37(23.46%)	17.22(20.72%)	12.28(28.85%)
Tidal KE.	269.32(54.69%)	232.06(55.94%)	315.43(80.30%)			
Di/Semi	0.23	0.24	0.23			
Net cur.	7.27 ± 2.35 at 4.2	1.76 ± 1.90 at 354.8	1.05 ± 0.72 at 142.4	4.95 ± 1.24 at 242.6	6.07 ± 1.75 at 222.9	1.83 ± 1.14 at 185.4
Mean cur.	12.9	11.0	5.5	9.5	10.2	6.1
8401 at 35 m	******	******	******	******	******	******
Total KE	489.34	390.82	165.04			
KE > 10d.	86.31(17.64%)	49.65(12.70%)	12.71(7.70%)			
KE 2-10 d.	143.55(29.34%)	107.00(27.38%)	20.85(12.63%)			
KE 2-5 d.	68.67(14.03%)	86.56(22.15%)	14.39(8.72%)			
Tidal KE.	214.46(43.83%)	197.22(50.46%)	113.63(68.85%)			
Di/Semi	0.35	0.30	0.46			
Net cur.	7.17 ± 2.33 at 0.3	1.74 ± 1.86 at 6.3	0.17 ± 0.64 at 317.7			
Mean cur.	13.3	10.7	4.5			

Table 7a-c: Seasonal Correlation Coefficients
Table 7a: 84280-85004

	8407 18 m	8407 48 m	8410 22 m	8410 37 m	8411 33 m	8406 15 m	8406 30 m	8403 10 m	8403 18 m	8404 10 m	8404 20 m	8404 30 m	8402 10 m	8402 30 m	8401 20 m	8401 35 m
8407 at 18 m	^^^^^	.98/0	---/3	---/4	---/4	---/0	---/0	---/0	---/0	.43/0	.47/0	.43/0	.36/0	.44/0	---/4	---/4
8407 at 48 m	.98/0	^^^^^	---/3	---/4	---/4	---/0	---/0	---/0	---/0	.41/0	.45/0	.43/0	.35/0	.44/0	---/4	---/4
8410 at 22 m	---/0	---/0	^^^^^	.99/0	.87/0	-.62/0	-.63/0	-.44/0	-.36/0	-.31/0	-.30/0	-.27/0	.65/1	.71/1	.82/0	.77/0
8410 at 37 m	---/0	---/0	.99/0	^^^^^	.85/1	-.61/0	-.63/0	-.45/0	-.37/0	-.32/0	-.32/0	-.30/0	.65/2	.71/2	.82/0	.76/0
8411 at 33 m	---/3	---/0	.87/0	.85/0	^^^^^	-.50/0	-.50/0	-.36/0	-.34/0	-.30/0	-.31/0	-.27/0	.58/1	.65/1	.79/0	.83/0
8406 at 15 m	---/1	---/1	-.64/1	-.62/1	-.58/2	^^^^^	.99/0	.68/0	.62/0	.74/0	.73/0	.70/0	-.46/4	-.49/4	-.68/0	-.60/0
8406 at 30 m	---/1	---/1	-.65/1	-.63/1	-.57/2	.99/0	^^^^^	.66/0	.61/0	.73/0	.72/0	.69/0	-.48/4	-.50/4	-.68/0	-.60/0
8403 at 10 m	---/3	.27/4	-.57/3	-.56/2	-.57/3	.81/2	.80/2	^^^^^	.85/0	.86/1	.83/1	.80/1	---/4	-.28/4	-.67/1	-.62/1
8403 at 18 m	---/1	---/2	-.41/2	-.41/2	-.43/2	.68/1	.67/1	.85/0	^^^^^	.79/0	.82/1	.81/1	---/0	-.24/4	-.59/0	-.57/0
8404 at 10 m	.45/1	.44/1	-.40/3	-.39/2	-.46/3	.80/1	.79/1	.85/0	.79/0	^^^^^	.94/0	.90/0	.28/0	.28/0	-.55/0	-.51/1
8404 at 20 m	.47/0	.46/1	-.36/2	-.36/2	-.42/3	.75/1	.74/1	.77/0	.80/0	.94/0	^^^^^	.97/0	---/0	---/0	-.52/0	-.47/0
8404 at 30 m	.43/0	.43/1	-.34/2	-.34/2	-.39/3	.73/1	.73/1	.74/0	.79/0	.90/0	.97/0	^^^^^	.26/0	.28/0	-.47/0	-.42/0
8402 at 10 m	.37/1	.37/1	.62/0	.61/0	.55/0	---/0	---/0	---/1	.26/2	.38/2	.40/2	.41/2	^^^^^	.89/0	.33/0	.32/0
8402 at 30 m	.44/1	.46/1	.66/0	.66/0	.62/0	---/4	---/0	---/1	---/1	.37/2	.38/2	.42/2	.89/0	^^^^^	.37/0	.39/0
8401 at 20 m	---/0	---/0	.85/1	.85/1	.85/1	-.68/0	-.68/1	-.64/0	-.59/0	-.55/0	-.52/0	-.47/0	.58/4	.61/4	^^^^^	.93/0
8401 at 35 m	---/4	---/0	.79/1	.77/1	.87/1	-.60/0	-.60/0	-.57/0	-.57/0	-.49/0	-.47/0	-.42/0	.51/4	.54/3	.93/0	^^^^^

Correlation with Wind

	8407 18 m	8410 37 m	8404 20 m	8401 20 m
Wind1	-.62/1	-.80/2	---/0	-.71/2
Wind2	-.66/1	-.80/2	-.53/2	-.71/2

Table 7b: 85004-85094

	8408 40 m	8407 18 m	8407 48 m	8410 22 m	8410 37 m	8411 33 m	8406 15 m	8403 18 m	8404 20 m	8404 30 m	8401 20 m	8401 35 m
8408 at 40 m	^^^^^	.64/0	.61/0	.83/0	.82/0	.67/0	---/0	---/3	---/3	---/0	.40/0	.34/0
8407 at 18 m	.64/0	^^^^^	.98/0	---/0	---/0	---/4	.39/1	---/0	.52/0	.46/0	---/0	---/0
8407 at 48 m	.61/0	.98/0	^^^^^	---/0	---/0	---/1	.39/1	---/0	.53/0	.49/0	---/0	---/0
8410 at 22 m	.83/0	---/1	---/1	^^^^^	1.00/0	.89/0	-.64/0	---/4	-.27/0	-.37/0	.70/0	.66/0
8410 at 37 m	.83/1	---/1	---/3	1.00/0	^^^^^	.89/0	-.64/0	---/4	-.27/0	-.37/0	.73/0	.68/0
8411 at 33 m	.68/1	---/4	---/4	.89/0	.89/0	^^^^^	-.71/0	---/0	-.36/0	-.45/0	.79/0	.77/0
8406 at 15 m	---/2	.38/0	.39/0	-.64/0	-.64/0	-.71/0	^^^^^	.29/0	.73/0	.68/0	-.74/0	-.74/0
8403 at 18 m	---/4	---/3	---/3	---/1	---/0	---/1	.33/1	^^^^^	.68/1	.69/0	-.30/0	-.30/0
8404 at 20 m	---/0	.52/0	.53/0	-.28/1	-.28/1	-.38/1	.73/1	.68/0	^^^^^	.90/0	-.58/0	-.60/0
8404 at 30 m	---/3	.46/0	.49/1	-.38/1	-.37/1	-.47/1	.69/1	.60/0	.90/0	^^^^^	-.62/0	-.62/0
8401 at 20 m	.50/2	---/0	---/0	.78/2	.79/1	.87/1	-.80/1	-.30/0	-.58/1	-.64/1	^^^^^	.95/0
8401 at 35 m	.42/2	---/0	---/0	.72/1	.73/1	.83/1	-.78/1	-.30/0	-.60/0	-.62/0	.95/0	^^^^^

Correlation with Wind

	8408 40 m	8407 18 m	8410 37 m	8404 20 m	8401 20 m
Wind1	-.68/1	-.65/1	-.56/1	---/2	-.29/0
Wind2	-.84/1	-.68/1	-.82/1	-.40/1	-.66/1

Table 7c: 85094-85184

	8408 40 m	8407 18 m	8407 48 m	8410 37 m	8411 33 m	8406 15 m	8403 10 m	8403 18 m	8404 10 m	8404 20 m	8404 30 m	8401 20 m	8401 35 m
8408 at 40 m	^^^^^	---/0	---/0	.83/0	.70/0	---/0	---/0	---/0	---/0	---/4	---/0	.50/0	.36/0
8407 at 18 m	---/4	^^^^^	.98/0	---/0	-.36/0	.53/0	---/4	---/4	.34/0	.42/0	.40/0	-.39/0	-.47/0
8407 at 48 m	---/4	.98/0	^^^^^	---/0	-.39/0	.57/0	---/4	---/4	.36/0	.44/0	.42/0	-.44/0	-.48/0
8410 at 37 m	.83/0	---/3	---/2	^^^^^	.88/0	-.58/0	-.36/0	-.33/0	---/0	-.29/0	-.39/0	.70/0	.60/0
8411 at 33 m	.70/0	-.37/1	-.39/1	.88/0	^^^^^	-.64/0	---/0	---/0	---/0	-.26/0	-.33/0	.72/0	.68/0
8406 at 15 m	---/0	.55/1	.58/1	-.58/0	-.64/1	^^^^^	.45/0	.49/0	.58/0	.59/0	.60/0	-.69/0	-.61/0
8403 at 10 m	---/2	.31/3	.33/3	-.44/2	-.39/3	.57/2	^^^^^	.88/0	.80/0	.78/1	.77/1	-.53/1	-.61/2
8403 at 18 m	---/1	.26/3	.26/3	-.38/1	-.30/2	.55/1	.88/0	^^^^^	.75/0	.80/0	.78/1	-.42/0	-.57/1
8404 at 10 m	---/1	.45/2	.47/2	-.33/1	-.31/2	.64/1	.80/0	.75/0	^^^^^	.89/0	.81/0	-.55/0	-.62/1
8404 at 20 m	---/1	.50/2	.52/2	-.33/1	-.32/2	.63/1	.75/0	.80/0	.89/0	^^^^^	.92/0	-.56/0	-.65/1
8404 at 30 m	---/1	.45/1	.47/1	-.42/1	-.36/1	.63/1	.71/0	.78/0	.81/0	.92/0	^^^^^	-.63/0	-.64/1
8401 at 20 m	.54/1	-.46/2	-.50/2	.76/1	.77/1	-.72/1	-.50/0	-.42/0	-.55/0	-.56/0	-.63/0	^^^^^	.77/1
8401 at 35 m	.36/1	-.49/1	-.50/1	.60/1	.68/0	-.61/0	-.45/0	-.47/0	-.56/0	-.61/0	-.62/0	.75/0	^^^^^

Correlation with Wind

	8408 40 m	8407 18 m	8410 37 m	8404 20 m	8401 20 m
Wind1	-.78/1	-.41/1	-.81/2	---/1	-.55/1
Wind2	-.79/1	-.43/2	-.81/2	.29/1	-.58/1

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