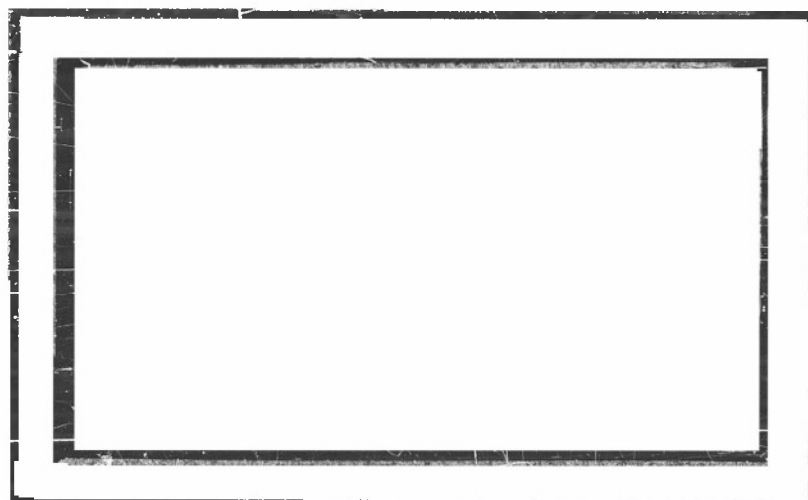


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the rotor since the previous transmission; (ii) the number of revolutions of the anemometer since the previous transmission; (iii) the instantaneous magnetic heading of the buoy; (iv) the instantaneous bearing of the wind relative to the buoy. These wireless signals turn on the magnetic tape recording equipment in the land-based observatory so that the data is available for reduction in recorded form. The operation of the receiving station is entirely automatic except for occasional changing of reels of recording tape. The system in use at present works satisfactorily over distances up to 45 miles. Rough weather, even of moderate gale force, does not harm the buoys.

Calibration of the rotors was carried out in a tidal channel on the island. Because the buoys are free drifting they do not measure the velocity of the surface drift relative to the ocean bottom. They measure the vectorial difference of the surface velocity and the velocity at the depth of the drogue. The areas of the can and rotor together (in the surface water) and of the drogue (in the deep water) are nearly equal so that the actual speed of the vectorial difference is twice the speed past the surface rotor. The orientation of the buoy is determined by the direction of the vectorial difference. In this connection every effort has been made to reduce the area exposed to the wind. There is a small deflection (averaging  $10^{\circ}$ ) of the orientation of the buoy from the direction of the vectorial difference of surface and deep velocities, due to Magnus effect of the rotor. A correction for this has been made on the basis of experiments made in a tidal channel; and the sense of rotation of the rotor was reversed in some of the later buoys in order to eliminate this possible source of error from the data.

The telemetering itself is done in the following manner: the various sensing elements operate variable electric resistances, which produce variable audio frequencies which in turn are transmitted as a modulation of the radio frequencies. It is believed that adequate precautions were taken to prevent possible errors in the telemetering system. Messrs. Robert G. Walden and Donald Parsen, Jr. collaborated with me in the design and construction of the buoys.

## II. DISCUSSION OF DATA

The original data from the buoys, including all cases where the buoys were not near to the shore of the island, is collected in Table I. Perhaps the most striking feature of this data is the considerable irregularity of the currents even during days while the wind is fairly steady. In his discussion of the current measurements which he made on board the "Armauer Hansen" in 1930, Ekman (1953) has called this irregular motion a kind of "macro-turbulence". As a result it is difficult to extract from the data definite statements about such things as: (i) the deviation of the surface current from the direction of the surface wind; and (ii) the ratio of current speed to the speed of the wind producing it. Ekman (1953) attempted to analyze his data for "Armauer Hansen" anchor station D in order to find the answer to these questions and to delineate the drift current spiral as a function of depth. Because of the macro-turbulence the results of his analysis were disappointingly indefinite. The purpose of such an analysis, of course, was to verify in the deep ocean the results of his theory (1905).

The present buoy measurements are confined to the surface. They cover a longer period than those made on the "Armauer Hansen". It is therefore

hopeful that certain features of drift currents may emerge more clearly from the confusion of the macro-turbulence.

In order to appreciate how serious an obstacle the macro-turbulence is to a simple analysis of the data, an analysis can be made of all the wind vane readings obtained from buoys 2, 3, 4 and 8 (Table II). The current direction correction due to the Magnus effect on the rotor has been applied. As can be seen, there is a very large scatter of the angle of deviation of the current from the wind; at one time or another every possible angle has occurred. On the average, however, there is a greater frequency of small angles of deviation showing that usually a current does not run against the wind. Moreover, there is a rather definite indication that currents to the right of the wind are more frequent than currents to the left of the wind. The mode of this frequency distribution lies at about  $20^{\circ}$  to the right of the wind, but it is obvious that this type of analysis of the data, including as it does all cases where the winds were rapidly varying, and all cases with pronounced irregular motions or possible inertial oscillations, gives at best a very diffuse and indefinite kind of answer to question (1). Similar objections can be raised to an attempt to make a gross average for determining the ratio of current to wind velocity. A more rational approach is to study individual cases where the wind was observed to be steady. Of course the currents are not exactly steady during the same time. The question arises as to how long a time interval to employ for the study of individual cases. Ekman (1905) indicated that after the onset of a wind the average of the current for the first 24 hours (at  $30^{\circ}\text{N}$ ) is a very close approximation to the theoretical current produced by a wind of infinite duration. Thus, in

attempting to find answers to questions such as (i) and (ii) (above), 24-hour vectorial averages of wind and current are formed for days of steady wind. The concept of a steady wind is subjective.

The data obtained from October 28-31 is a good sample of the relation between wind and current as it actually appears in nature (Figure 5). During October 28 the wind began to blow toward the north and by midnight was blowing about 23 knots; the currents, which were at first weak and variable, gradually veered to the right of the wind and grew stronger. Early on October 29 the wind itself veered until it blew toward NNE. The current veered, too, and executed a rotatory motion about a mean velocity about  $42^\circ$  to the right of the wind. During the afternoon of October 30, the wind dropped rapidly, and the current began to execute a rotatory (inertial) motion about a zero mean velocity. By October 31, the winds were light and variable and the motions of the current were very irregular and confused. All evidence of a simple 24-hour inertial period was gone. During the winter of 1953-1954 the currents in the Northwestern Sargasso Sea are most often in a confused state such as depicted on October 31. It is only during days of steady strong winds, and immediately following them, that the theoretical features deduced by Ekman (1905) are clearly defined.

Table III contains means of wind and current for all days during which the wind was steady. It was prepared for the purpose of examining the data from the 24-hour mean "case history" point of view.

### III. THE ANGLE BETWEEN THE WIND AND CURRENT

Two independent ways of measuring the angle between wind and current are possible. The angle may be determined by comparing the mean wind

direction at the observatory with direction of the current given by the magnetic compass on the buoy (Method 1). The angle may also be determined directly from the wind vane on the buoy, which measures the instantaneous angle between wind and buoy orientation (Method 2). Although this latter method is direct, it is likely to be more erratic due to gustiness of the wind - the sampling of wind direction from wind vane measurements on the buoy is naturally much poorer than the continuous records available at the observatory.

By both methods it is seen that (in agreement with Ekman, 1905) the current is to the right of the wind, by an angle varying between  $30^{\circ}$  and  $60^{\circ}$ . During weak winds there is a greater spread of angles, and on the average the angle appears to be less than for strong winds.

#### IV. THE RATIO OF CURRENT SPEED TO WIND SPEED

The ratios of current speed to wind speed cited in Table III are about twice what would be expected from Ekman's study. When plotted on a logarithmic scale (Figure 6) these data give some indication that the ratio is not independent of wind speed. There is enough scatter in the data to prevent certainty concerning this point. Ekman (1905) discussed the case of a "quadratic" law of friction in the sea, and showed that in this case the current speed would be proportional to the three-halves power of the wind speed (rather than linearly proportional). The very limited data at hand suggests the reality of this law of friction, but of course does not prove it. The solid line in Figure 6 depicts the linear law; the dashed line, the three-halves law.

## V. THE PRESENCE OF INERTIAL OSCILLATIONS

The design of the rig used on these buoys is not ideal for detecting or studying inertial oscillations because, as Fredholm (Ekman, 1905) showed, the inertial motions penetrate quickly to layers below the depth of frictional influence, and hence the inertial, or quasi-periodic, term in the vectorial difference of velocity is likely to diminish quickly if the deep drag is not much below the depth of frictional influence. Very clear and distinct rotary currents with 24-hour period were observed on 14 separate days (Table IV); they were quickly damped out (whether by vertical diffusion of momentum, or horizontal dispersion of energy in the form of gravity waves is uncertain). The sense of rotation in every case was cum sole. Comparison of phase, to time of transit of the moon results in a complete scatter, thus ruling out the likelihood that these 24-hour periods are lunar tidal currents. There is also no relation to time of day, thus ruling out solar tides.

REFERENCES

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Ekman, V. W., 1953: Results of a cruise on board the "Armauer Hansen" in 1930 under the leadership of Bjørn Helland-Hansen. Studies on Ocean Currents. Pt. I. Text. Pt. II. Tables and Plates. Geofys. Publ., 19 (1): 106 + 122 pp.

TABLE I  
DATA FOR ALL CASES WHERE BOOTS WERE BEYOND ISLAND INFLUENCE

| Local Time                 | Wind Dir. | Wind Spd. | Boat No. | Trans. Time | Current Dir. | Current Spd. | Wind Vane |
|----------------------------|-----------|-----------|----------|-------------|--------------|--------------|-----------|
| 1953<br>Oct. 27<br>TN 0003 |           |           |          |             |              |              |           |
| 0600                       | 200       | 1         | 3        | 0024        | 080          | 0.27         | 330       |
| 0300                       | 200       | 1         | 3        | 0325        | 035          | 0.85         | 210       |
| 0600                       | 200       | 1         | 3        | 0425        | 060          | 0.74         | 225       |
| 0900                       | 160       | 6         | 3        | 0922        | 105          | 0.10         | 160       |
| 1200                       | 180       | 8         | 3        | 1222        | 305          | 0.69         | 000       |
| 1500                       | 180       | 5         | 3        | 1524        | 020          | 0.61         | 000       |
| 1800                       | 190       | 3         | 3        | 1823        | 100          | 0.72         | 240       |
| 2100                       | 200       | 5         | 3        | 2123        | 195          | 0.69         | 130       |
| Oct. 28<br>TN 0058         |           |           |          |             |              |              |           |
| 0000                       | 200       | 7         | 3        | 0023        | 250          | 0.46         | 070       |
| 0300                       | 180       | 8         | 3        | 0323        | 310          | 0.61         | 030       |
| 0600                       | 170       | 8         | 3        | 0623        | 340          | 0.74         | 000       |
| 0900                       | 170       | 10        | 3        | 0923        | 340          | 0.54         | 320       |
| 1200                       | 180       | 15        | 3        | 1223        | 350          | -            | 000       |
| 1500                       | 180       | 16        | 3        | 1523        | 035          | 0.74         | 000       |
| 1800                       | 180       | 15        | 3        | 1824        | 345          | 0.64         | 105       |
| 2100                       | 170       | 19        | 3        | 2122        | 000          | 0.52         | 310       |
|                            |           |           | 3        | 2145        | 080          | 0.34         | 340       |
| Oct. 29<br>TN 0148         |           |           |          |             |              |              |           |
| 0000                       | 180       | 23        | 3        | 0022        | 010          | 0.86         | 270       |
| 0300                       | 200       | 25        | 3        | 0321        | 035          | 0.48         | 220       |
| 0600                       | 150       | 23        | 3        | 0621        | 100          | 0.98         | 250       |
| 0900                       | 100       | 23        | 3        | 0922        | 080          | 0.30         | 350       |
| 1200                       | 200       | 25        | 3        | 1222        | 090          | 0.69         | 290       |
| 1500                       | 200       | 26        | 3        | 1522        | 055          | 0.77         | 240       |
| 1800                       | 200       | 25        | 3        | 1822        | 070          | 0.90         | 000       |
| 2100                       | 200       | 23        | 3        | 2122        | 090          | 0.93         | 340       |
|                            |           |           | 3        | 2149        | 045          | 0.05         | 000       |

| Local Time                 | Wind Dir. | Wind Spd. | Boat No. | Trans. Time | Current Dir. | Current Spd. | Wind Vane |
|----------------------------|-----------|-----------|----------|-------------|--------------|--------------|-----------|
| 1953<br>Oct. 30<br>TN 0234 |           |           |          |             |              |              |           |
| 0000                       | 200       | 27        | 3        | 0022        | 105          | 0.51         | 220       |
| 0300                       | 200       | 26        | 3        | 0322        | 060          | 0.83         | 310       |
| 0600                       | 200       | 27        | 3        | 0622        | 070          | 0.90         | 300       |
| 0900                       | 200       | 25        | 3        | 0921        | 060          | 1.01         | 355       |
| 1200                       | 200       | 26        | 3        | 1221        | 340          | 0.51         | 080       |
| 1500                       | 200       | 26        | 3        | 1522        | 010          | 0.71         | 080       |
| 1800                       | 190       | 22        | 3        | 1821        | 080          | 0.82         | 010       |
| 2100                       | 270       | 5         | 3        | 2122        | 090          | 0.74         | 355       |
|                            |           |           | 3        | 2154        | 070          | 0.88         | 340       |
|                            |           |           | 3        | 2155        | 235          | 0.46         | 030       |
|                            |           |           | 3        | 2152        | 090          | 0.86         | 000       |
| Oct. 31<br>TN 0317         |           |           |          |             |              |              |           |
| 0000                       | 260       | 2         | 3        | 0020        | 290          | 0.80         | 270       |
| 0300                       | 000       | 14        | 3        | 0320        | 050          | 0.08         | 000       |
| 0600                       | 000       | 13        | 3        | 0620        | 150          | 0.80         | 000       |
| 0900                       | 100       | 11        | 3        | 0920        | 125          | 0.80         | 000       |
| 1200                       | 320       | 9         | 3        | 1220        | 170          | 0.70         | 290       |
| 1500                       | 270       | 5         | 3        | 1520        | 130          | 0.32         | 145       |
| 1800                       | 220       | 7         | 3        | 1820        | 035          | 0.98         | 315       |
| 2100                       | 220       | 9         | 3        | 2120        | 105          | 0.34         | 000       |
|                            |           |           | 3        | 2212        | -            | 0.70         | 000       |
| Nov. 1<br>TN 0357          |           |           |          |             |              |              |           |
| 0000                       | 320       | 5         | 3        | 0020        | 105          | 0.77         | 000       |
| 0300                       | 320       | 7         | 3        | 0320        | 000          | 0.77         | 055       |
| 0600                       | 280       | 7         | 3        | 0620        | 070          | 0.67         | 020       |
| 0900                       | 270       | 11        | 3        | 0920        | 105          | -            | 002       |
| 1200                       | 330       | 12        | 3        | 1220        | 070          | 0.48         | 350       |
| 1500                       | 280       | 12        | 3        | 1520        | 125          | 0.74         | 315       |
| 1800                       | 340       | 12        | 3        | 1820        | 150          | 0.75         | 270       |
| 2100                       | 350       | 7         | 3        | 2120        | 110          | 0.88         | 290       |
|                            |           |           | 3        | 2220        | -            | 0.47         | 460       |

| Local Time                | Wind Dir. | Wind Spd. | Boat No. | Trans. Time | Current Dir. | Current Spd. | Wind Vane |
|---------------------------|-----------|-----------|----------|-------------|--------------|--------------|-----------|
| 1953<br>Nov. 2<br>TN 0437 |           |           |          |             |              |              |           |
| 0000                      | 340       | 3         | 3        | 0047        | 190          | 0.82         | 300       |
| 0300                      | 340       | 5         | 3        | 0347        | -            | 2.08         | 035       |
| 0600                      | 000       | 6         | 3        | 0647        | 180          | 0.67         | 290       |
| 0900                      | 070       | 2         | 3        | 0947        | 250          | 0.77         | 045       |
| 1200                      | 080       | 6         | 3        | 1247        | -            | 0.30         | 270       |
| 1500                      | 000       | 7         | 3        | 1547        | 230          | 0.88         | 280       |
| 1800                      | 040       | 5         | 3        | 1847        | -            | 0.27         | 080       |
| 2100                      | -         | -         | 3        | 2147        | 215          | 0.26         | 000       |
|                           |           |           | 3        | 2224        | -            | 0.54         | 180       |
|                           |           |           | 3        | 2224        | 180          | 0.61         | 090       |
|                           |           |           | 3        | 2224        | 205          | 1.76         | 090       |
|                           |           |           | 3        | 2224        | -            | 0.64         | 000       |
|                           |           |           | 3        | 2224        | 260          | 0.67         | 310       |
|                           |           |           | 3        | 2224        | -            | 0.19         | 210       |
| Nov. 3<br>TN 0517         |           |           |          |             |              |              |           |
| 0000                      | 045       | 8         | 3        | 0019        | 245          | 0.74         | 290       |
| 0300                      | 110       | 3         | 3        | 0319        | -            | 0.37         | 320       |
| 0600                      | 060       | 5         | 3        | 0619        | 210          | 0.51         | 300       |
| 0900                      | 045       | 11        | 3        | 0919        | -            | 0.74         | 280       |
| 1200                      | 045       | 10        | 3        | 1219        | 215          | 0.61         | 315       |
| 1500                      | 045       | 8         | 3        | 1519        | -            | 0.77         | 120       |
| 1800                      | -         | -         | 3        | 1819        | 210          | 0.67         | 000       |
| 2100                      | 030       | 5         | 3        | 2119        | -            | 0.58         | 350       |
|                           |           |           | 3        | 2216        | 215          | 0.67         | 320       |
|                           |           |           | 3        | 2216        | -            | 0.13         | 000       |
|                           |           |           | 3        | 2216        | 215          | 0.30         | 340       |
|                           |           |           | 3        | 2216        | -            | 0.32         | 340       |
|                           |           |           | 3        | 2216        | 190          | -            | 010       |
|                           |           |           | 3        | 2216        | -            | 0.74         | 310       |
|                           |           |           | 3        | 2216        | 220          | 0.54         | 210       |
|                           |           |           | 3        | 2216        | -            | 0.62         | 210       |
| Nov. 4<br>TN 0558         |           |           |          |             |              |              |           |
| 0000                      | 045       | 3         | 3        | 0020        | 260          | 0.62         | 290       |
| 0300                      | 090       | 2         | 3        | 0320        | -            | 0.88         | 110       |
| 0600                      | 045       | 3         | 3        | 0620        | 300          | 0.52         | 240       |
| 0900                      | 023       | 5         | 3        | 0920        | -            | 0.29         | 135       |
| 1200                      | 010       | 5         | 3        | 1220        | 330          | 0.53         | 180       |
| 1500                      | 000       | 3         | 3        | 1520        | -            | 0.03         | 325       |
| 1800                      | 005       | 3         | 3        | 1820        | 350          | 0.54         | 130       |
| 2100                      | 025       | 4         | 3        | 2120        | -            | 0.57         | 135       |
|                           |           |           | 3        | 2228        | 105          | 0.54         | 060       |
|                           |           |           | 3        | 2228        | -            | 0.54         | 325       |
|                           |           |           | 3        | 2228        | 330          | 0.54         | 210       |
|                           |           |           | 3        | 2228        | -            | 0.69         | 270       |
|                           |           |           | 3        | 2228        | 330          | 0.61         | 210       |
|                           |           |           | 3        | 2228        | -            | 0.77         | 225       |
|                           |           |           | 3        | 2228        | 330          | 0.43         | 110       |

| Local Time                | Wind Dir. | Wind Spd. | Boat No. | Trans. Time | Current Dir. | Current Spd. | Wind Vane |
|---------------------------|-----------|-----------|----------|-------------|--------------|--------------|-----------|
| 1953<br>Nov. 5<br>TN 0640 |           |           |          |             |              |              |           |
| 0000                      | -         | calm      | 3        | 0036        | 025          | 0.42         | 090       |
| 0300                      | 010       | 5         | 3        | 0336        | -            | 0.11         | 090       |
| 0600                      | 015       | 3         | 3        | 0636        | 090          | 0.58         | 060       |
| 0900                      | 032       | 2         | 3        | 0936        | -            | 0.56         | 305       |
| 1200                      | 055       | 3         | 3        | 1236        | 220          | 0.62         | 160       |
| 1500                      | 075       | 4         | 3        | 1536        | 270          | 0.69         | 215       |
| 1800                      | 075       | 5         | 3        | 1836        | 310          | 0.46         | 150       |
| 2100                      | 105       | 8         | 3        | 2136        | -            | 0.69         | 280       |
|                           |           |           | 3        | 2203        | 310          | 0.69         | 085       |
|                           |           |           | 3        | 2203        | 165          | 0.10         | 000       |
|                           |           |           | 3        | 2203        | 195          | 0.62         | 135       |
|                           |           |           | 3        | 2203        | -            | 0.37         | 315       |
|                           |           |           | 3        | 2203        | 010          | 0.61         | 280       |
|                           |           |           | 3        | 2203        | -            | 0.54         | 090       |
| Nov. 6<br>TN 0725         |           |           |          |             |              |              |           |
| 0000                      | 110       | 7         | 3        | 0047        | 000          | 0.72         | 000       |
| 0300                      | 122       | 11        | 3        | 0347        | -            | 0.64         | 070       |
| 0600                      | 120       | 5         | 3        | 0647        | 300          | 0.19         | 110       |
| 0900                      | 122       | 12        | 3        | 0947        | -            | 0.90         | 000       |
| 1200                      | 120       | 14        | 3        | 1246        | 340          | 0.77         | 130       |
| 1500                      | 135       | 15        | 3        | 1547        | -            | 0.34         | 000       |
| 1800                      | 135       | 13        | 3        | 1846        | 010          | 0.72         | 315       |
| 2100                      | 125       | 12        | 3        | 2146        | -            | 0.14         | 340       |
|                           |           |           | 3        | 2246        | 040          | 0.75         | 215       |
|                           |           |           | 3        | 2246        | -            | 0.70         | 340       |
|                           |           |           | 3        | 2246        | 340          | 0.48         | 280       |
|                           |           |           | 3        | 2246        | -            | 0.67         | 325       |
|                           |           |           | 3        | 2246        | 320          | 0.77         | 350       |
|                           |           |           | 3        | 2246        | -            | 0.94         | 100       |
|                           |           |           | 3        | 2246        | 340          | 0.72         | 300       |
|                           |           |           | 3        | 2317        | -            | 0.10         | 355       |
| Nov. 7<br>TN 0813         |           |           |          |             |              |              |           |
| 0000                      | 140       | -         | 3        | 0046        | 000          | 0.78         | 330       |
| 0300                      | 150       | 11        | 3        | 0346        | -            | 0.25         | 315       |
| 0600                      | 180       | -         | 3        | 0646        | 020          | 0.51         | 290       |
| 0900                      | 180       | -         | 3        | 0946        | 030          | 0.69         | 350       |
| 1200                      | 220       | -         | 3        | 1246        | -            | 0.77         | 290       |
| 1500                      | 195       | -         | 3        | 1546        | 010          | 0.83         | 315       |
| 1800                      | 123       | 7         | 3        | 1846        | -            | 0.80         | 005       |
| 2100                      | 220       | 6         | 3        | 2146        | 350          | 0.59         | 310       |
|                           |           |           | 3        | 2246        | -            | 0.03         | 015       |
|                           |           |           | 3        | 2246        | 035          | 0.43         | 340       |
|                           |           |           | 3        | 2246        | -            | 0.51         | 010       |
|                           |           |           | 3        | 2246        | 050          | 0.74         | 350       |
|                           |           |           | 3        | 2246        | 290          | -            | 000       |
|                           |           |           | 3        | 2333        | -            | 0.83         | 025       |

| Local Time          | Wind Dir. mph | Baro. No. | Trans. Time | Current Dir. knots | Wind Vane    |
|---------------------|---------------|-----------|-------------|--------------------|--------------|
| 1953 Nov. 8 TH 0905 |               |           |             |                    |              |
| 0000                | 220           | calm      | 3           | 0045               | 160 0.66 000 |
| 0300                | 225           | calm      | 3           | 0345               | 170 0.70 000 |
| 0600                | 205           | 2         | 3           | 0645               | 215 0.68 300 |
| 0900                | 050           | 4         | 3           | 0944               | 210 0.74 300 |
| 1200                | 070           | 5         | 3           | 1244               | 230 0.82 260 |
| 1500                | 050           | 6         | 3           | -                  | -            |
| 1800                | 050           | 5         | 3           | 1844               | 250 0.69 270 |
| 2100                | 060           | 6         | 3           | 2144               | 250 0.75 270 |
| Nov. 9 TH 0958      |               |           |             |                    |              |
| 0000                | 015           | 6         | 3           | 0043               | 240 0.72 000 |
| 0300                | 060           | 6         | 3           | 0343               | 225 0.64 290 |
| 0600                | 080           | 3         | 3           | 0642               | 250 0.54 290 |
| 0900                | 078           | 7         | 3           | 0942               | 230 0.67 300 |
| 1200                | 120           | 7         | -           | -                  | -            |
| 1500                | 070           | 3         | 3           | 1542               | 280 0.74 260 |
| 1800                | 085           | 6         | 3           | 1841               | 305 0.43 240 |
| 2100                | 080           | 6         | 3           | 2141               | 220 0.58 000 |
| Nov. 10 TH 1053     |               |           |             |                    |              |
| 0000                | 094           | 5         | 3           | 0041               | 220 0.59 010 |
| 0300                | 094           | 3         | -           | -                  | -            |
| 0600                | 090           | 3         | 3           | 0640               | 125 0.64 110 |
| 0900                | 095           | 2         | 3           | 0940               | 000 0.27 270 |
| 1200                | 090           | 3         | 3           | 1240               | 050 0.58 235 |
| 1500                | 090           | 1         | 3           | 1539               | 060 0.64 240 |
| 1800                | -             | calm      | 3           | 1839               | 035 0.56 270 |
| 2100                | -             | calm      | 3           | 2138               | 000 0.69 340 |
| Nov. 11 TH 1147     |               |           |             |                    |              |
| 0000                | -             | calm      | 3           | 0037               | 030 0.18 350 |
| 0300                | 240           | 3         | 3           | 0337               | 040 0.72 300 |
| 0600                | 240           | 3         | 3           | 0637               | 105 0.64 260 |
| 0900                | 220           | 7         | -           | -                  | -            |
| 1200                | 190           | 10        | 3           | 1236               | 035 0.62 290 |
| Nov. 25             |               |           |             |                    |              |
| 0000                | 140           | 6         | 2           | 0048               | 010 0.72 200 |
| 0300                | 140           | 7         | 2           | 0348               | 015 0.85 305 |
| 0600                | 140           | 7         | 2           | 0648               | 010 0.77 310 |
| 0900                | 150           | 8         | 2           | 0945               | 080 0.77 305 |
| 1200                | 175           | 11        | 2           | 1246               | 055 0.69 295 |
| 1500                | 175           | 11        | 2           | 1544               | 110 0.80 070 |
| 1800                | 180           | 10        | 2           | 1834               | 090 0.37 290 |
| 2100                | 180           | 8         | 2           | 2128               | 095 0.80 225 |
| Nov. 26 TH 0027     |               |           |             |                    |              |
| 0000                | 185           | 15        | 2           | 0025               | 315 0.70 030 |
| 0300                | 185           | 11        | -           | -                  | -            |
| 0600                | 190           | 14        | 2           | 0625               | 005 0.62 020 |
| 0900                | 190           | 11        | -           | -                  | -            |
| 1200                | 185           | 15        | 2           | 1216               | 060 0.59 350 |
| 1500                | 185           | 18        | 2           | 1514               | 080 0.69 350 |
| 1800                | 190           | 15        | 2           | 1812               | 035 0.80 330 |
| 2100                | 195           | 23        | 2           | 2109               | 045 0.37 340 |

| Local Time           | Wind Dir. mph | Baro. No. | Trans. Time | Current Dir. knots | Wind Vane    |
|----------------------|---------------|-----------|-------------|--------------------|--------------|
| 1953 Nov. 27 TH 0112 |               |           |             |                    |              |
| 0000                 | 210           | 12        | 2           | 0007               | 010 0.72 010 |
| 0300                 | 260           | 11        | 2           | 0305               | 080 0.70 120 |
| 0600                 | 225           | 14        | 2           | 0608               | 080 0.83 350 |
| 0900                 | 225           | 14        | 2           | 0900               | 145 0.37 305 |
| 1200                 | 225           | 10        | 2           | 1158               | 145 0.82 300 |
| 1500                 | 225           | 8         | 2           | 1454               | 190 0.70 235 |
| 1800                 | 245           | 3         | 2           | 1753               | 215 0.80 225 |
| 2100                 | -             | calm      | 2           | 2050               | 255 0.37 210 |
| Nov. 28 TH 0154      |               |           |             |                    |              |
| 0000                 | -             | calm      | -           | -                  | -            |
| 0300                 | 280           | -         | 2           | 0245               | 305 0.69 010 |
| 0600                 | 280           | -         | 2           | 0640               | 035 0.77 280 |
| 0900                 | 280           | -         | 2           | 0842               | 070 0.54 305 |
| 1200                 | 270           | 5         | 2           | 1140               | 070 0.68 305 |
| 1500                 | 270           | 5         | 2           | 1437               | 090 0.77 290 |
| 1800                 | 225           | 3         | 2           | 1735               | 090 0.76 320 |
| 2100                 | 255           | 2         | 2           | 2033               | 090 0.74 330 |
| Nov. 29 TH 0234      |               |           |             |                    |              |
| 0000                 | 255           | 3         | -           | -                  | -            |
| 0300                 | 255           | 6         | 2           | 0230               | 095 0.69 340 |
| 0600                 | 260           | 8         | 2           | 0528               | 125 0.59 325 |
| 0900                 | 260           | 12        | 2           | 0824               | 110 0.75 135 |
| 1200                 | 250           | 10        | 2           | 1122               | 110 0.64 000 |
| 1500                 | 250           | 7         | 2           | 1420               | 125 0.66 020 |
| 1800                 | 015           | 7         | 2           | 1717               | 140 0.69 135 |
| 2100                 | 050           | 6         | 2           | 2016               | 165 0.69 020 |
| Nov. 30 TH 0314      |               |           |             |                    |              |
| 0000                 | 040           | 5         | -           | -                  | -            |
| 0300                 | 060           | 3         | -           | -                  | -            |
| 0600                 | 040           | 3         | 2           | 0510               | 090 0.88 105 |
| 0900                 | 045           | 5         | -           | -                  | -            |
| 1200                 | 095           | 6         | 2           | 1105               | 075 0.37 145 |
| 1500                 | 080           | 7         | 2           | 1404               | 010 0.26 240 |
| 1800                 | 070           | 4         | 2           | 1701               | 030 0.72 260 |
| 2100                 | -             | calm      | -           | -                  | -            |
| Dec. 1 TH 0354       |               |           |             |                    |              |
| 0000                 | 100           | 10        | -           | -                  | -            |
| 0300                 | 120           | 10        | -           | -                  | -            |
| 0600                 | 125           | 11        | -           | -                  | -            |
| 0900                 | 110           | 15        | 2           | 1050               | 010 - 350    |
| 1200                 | 150           | 6         | 2           | 1348               | 035 0.70 340 |
| 1500                 | 230           | 24        | 2           | 1646               | 090 0.37 295 |
| 1800                 | 225           | 22        | 2           | 1944               | 080 0.86 275 |
| 2100                 | 270           | 15        | 2           | 2042               | 100 0.85 210 |

| Local Time          | Wind Dir. mph | Baro. No. | Trans. Time | Current Dir. knots | Wind Vane    |
|---------------------|---------------|-----------|-------------|--------------------|--------------|
| 1953 Dec. 2 TH 0436 |               |           |             |                    |              |
| 0000                | 270           | 12        | 2           | 0140               | 105 0.80 330 |
| 0300                | 275           | 14        | 2           | 0439               | 100 0.61 295 |
| 0600                | 280           | 22        | 2           | 0737               | 070 0.91 350 |
| 0900                | 285           | 20        | 2           | 1035               | 115 0.93 080 |
| 1200                | 285           | 20        | 2           | 1333               | 055 0.64 350 |
| 1500                | 290           | 18        | 2           | 1631               | 100 0.91 350 |
| 1800                | 320           | 19        | 2           | 1929               | 115 0.80 350 |
| 2100                | 330           | 18        | 2           | 2228               | 120 0.90 325 |
| Dec. 3 TH 0540      |               |           |             |                    |              |
| 0000                | 330           | 15        | 2           | 0126               | 095 0.45 005 |
| 0300                | 330           | 14        | 2           | 0424               | 145 0.65 375 |
| 0600                | 330           | 15        | 2           | 0722               | 180 0.86 340 |
| 0900                | 330           | 16        | 2           | 1022               | 215 0.59 345 |
| 1200                | 335           | 15        | 2           | 1322               | 175 0.72 350 |
| 1500                | 340           | 16        | 2           | 1620               | 140 0.82 350 |
| 1800                | 000           | 12        | 2           | 1919               | 205 0.91 340 |
| 2100                | 000           | 11        | 2           | 2218               | 260 0.40 375 |
| Dec. 4 TH 0607      |               |           |             |                    |              |
| 0000                | 015           | 7         | 2           | 0110               | 130 0.83 350 |
| 0300                | 015           | 8         | 2           | 0410               | 350 0.75 210 |
| 0600                | 025           | 6         | -           | -                  | -            |
| 0900                | 030           | 7         | -           | -                  | -            |
| 1200                | 055           | 7         | -           | -                  | -            |
| 1500                | 075           | 8         | -           | -                  | -            |
| 1800                | 070           | 6         | -           | -                  | -            |
| 2100                | 095           | 9         | -           | -                  | -            |
| Dec. 5 TH 0658      |               |           |             |                    |              |
| 0000                | 095           | 6         | -           | -                  | -            |
| 0300                | 095           | 5         | -           | -                  | -            |
| 0600                | 100           | 4         | -           | -                  | -            |
| 0900                | 120           | 4         | -           | -                  | -            |
| 1200                | 080           | 2         | 8           | 1228               | 055 - 210    |
| 1500                | 080           | 4         | 8           | 1528               | 025 0.06 220 |
| 1800                | 80            | 4         | 8           | 1828               | 380 0.49 305 |
| 2100                | 080           | 2         | 8           | 2128               | 195 0.34 040 |
| Dec. 6 TH 0752      |               |           |             |                    |              |
| 0000                | 075           | 3         | 8           | 0028               | 185 0.39 015 |
| 0300                | 085           | 2         | 8           | 0328               | 230 0.43 325 |
| 0600                | 080           | 4         | 8           | 0628               | 130 0.69 280 |
| 0900                | 080           | 5         | 8           | 0929               | 010 0.36 250 |
| 1200                | 060           | 4         | 8           | 1229               | 030 0.56 240 |
| 1500                | 075           | 6         | 8           | 1529               | 080 0.60 230 |
| 1800                | 080           | 5         | 8           | 1829               | 290 0.42 010 |
| 2100                | 100           | 6         | 8           | 2127               | 305 0.34 040 |
| 1953 Dec. 7 TH 0847 |               |           |             |                    |              |
| 0000                | 150           | 5         | 8           | 0027               | 000 0.00 315 |
| 0300                | 180           | 10        | 8           | 0327               | 005 0.49 000 |
| 0600                | 180           | 6         | 8           | 0627               | 350 0.59 350 |
| 0900                | 220           | 8         | 8           | 0926               | 015 0.49 335 |
| 1200                | 225           | 12        | 8           | 1224               | 080 0.43 315 |
| 1500                | 230           | 12        | 8           | 1526               | 130 0.43 230 |
| 1800                | 245           | 3         | 8           | 1825               | 210 0.00 210 |
| 2100                | 260           | 2         | 8           | 2125               | 230 0.42 190 |
| Dec. 8 TH 0943      |               |           |             |                    |              |
| 0000                | 260           | 2         | 8           | 0025               | 230 0.54 175 |
| 0300                | 260           | 2         | 8           | 0325               | 215 0.46 225 |
| 0600                | -             | calm      | 8           | 0625               | 240 0.56 140 |
| 0900                | 010           | 4         | 8           | 0925               | 215 0.13 295 |
| 1200                | 035           | 5         | 8           | 1225               | 200 0.36 080 |
| 1500                | 080           | 6         | 8           | 1525               | 260 0.56 340 |
| 1800                | 125           | 3         | 8           | 1825               | 280 0.42 015 |
| 2100                | 125           | 4         | 8           | 2125               | 285 0.46 245 |
| Dec. 9 TH 1037      |               |           |             |                    |              |
| 0000                | 125           | 4         | 8           | 0025               | 350 0.60 300 |
| 0300                | 130           | 6         | 8           | 0325               | 130 0.07 320 |
| 0600                | 130           | 7         | 8           | 0625               | 135 0.52 315 |
| 0900                | 120           | 6         | 8           | 0925               | 305 0.49 330 |
| 1200                | 100           | 8         | 8           | 1225               | 035 0.46 315 |
| 1500                | 135           | 11        | 8           | 1525               | 030 0.52 300 |
| 1800                | 120           | 11        | 8           | 1825               | 080 0.56 215 |
| 2100                | 130           | 7         | 8           | 2125               | 200 0.13 080 |
| Dec. 10 TH 1129     |               |           |             |                    |              |
| 0000                | 120           | 7         | 8           | 0157               | 090 0.41 225 |
| 0300                | 150           | 11        | 8           | 0325               | 080 0.49 245 |
| 0600                | 180           | 14        | 8           | 0625               | 080 0.63 275 |
| 0900                | 180           | 15        | 8           | 0923               | 080 0.39 280 |
| 1200                | 200           | 18        | 8           | 1223               | 080 0.29 305 |
| 1500                | 225           | 17        | 8           | 1521               | 080 0.83 285 |
| 1800                | 225           | 15        | 8           | 1821               | 085 0.95 295 |
| 2100                | 255           | 14        | 8           | 2121               | 095 0.53 260 |
| Dec. 11 TH 1219     |               |           |             |                    |              |
| 0000                | -             | calm      | 8           | 0021               | 130 0.70 260 |
| 0300                | 240           | 4         | 8           | 0321               | 110 0.90 260 |
| 0600                | 240           | 4         | 8           | 0621               | 150 0.43 302 |
| 0900                | 230           | 6         | 8           | 0921               | 150 0.13 290 |
| 1200                | 060           | 3         | 8           | 1221               | 195 0.83 115 |
| 1500                | 080           | 10        | 8           | 1521               | 195 0.85 000 |
| 1800                | 065           | 10        | 8           | 1821               | 200 0.70 010 |
| 2100                | 090           | 11        | 8           | 2121               | 195 0.00 020 |

| 1952<br>Dec. 12<br>TH 1308 | Local<br>Time | Wind |     | Dry<br>No. | Trans.<br>Time | Current |       | Wind<br>Tide |
|----------------------------|---------------|------|-----|------------|----------------|---------|-------|--------------|
|                            |               | Dir. | mph |            |                | Dir.    | knots |              |
|                            | 0000          | 090  | 12  | 8          | 0021           | 230     | 0.49  | 010          |
|                            | 0300          | 100  | 10  | 8          | 0121           | 190     | 0.42  | 030          |
|                            | 0600          | 110  | 10  | 8          | 0621           | 195     | 0.49  | 030          |
|                            | 0900          | 120  | 11  | 8          | 0921           | 190     | 0.46  | 100          |
|                            | 1200          | 150  | 11  | 8          | 1221           | 215     | 0.42  | 055          |
|                            | 1500          | 180  | 12  | 8          | 1521           | 205     | 0.17  | 080          |
|                            | 1800          | 200  | 14  | 8          | 1821           | 120     | 0.32  | 190          |
|                            | 2100          | 220  | 12  | 8          | 2121           | 100     | 0.40  | 275          |
|                            |               |      |     |            |                |         |       |              |
| Dec. 13<br>TH 1356         | 0000          | 220  | 15  | 8          | 0021           | 090     | 0.46  | 215          |
|                            | 0300          | 225  | 15  | 8          | 0321           | 180     | 0.46  | 185          |
|                            | 0600          | 225  | 14  | 8          | 0621           | 170     | 0.56  | 200          |
|                            | 0900          | 230  | 13  | 8          | 0921           | 120     | 0.07  | 235          |
|                            | 1200          | 240  | 17  | 8          | 1221           | 125     | 0.40  | 240          |
|                            | 1500          | 240  | 14  | 8          | 1521           | 120     | 0.60  | 235          |
|                            | 1800          | 220  | 11  | 8          | 1821           | 180     | 0.44  | 180          |
|                            | 2100          | 210  | 11  | 8          | 2121           | 185     | 0.07  | 135          |
|                            |               |      |     |            |                |         |       |              |
| Dec. 14<br>TH 1445         | 0000          | 220  | 13  | 8          | 0021           | 195     | 0.76  | 145          |
|                            | 0300          | 220  | 12  | 8          | 0321           | 120     | 0.73  | 215          |
|                            | 0600          | 210  | 13  | 8          | 0621           | 170     | 0.77  | 160          |
|                            | 0900          | 220  | 13  | 8          | 0918           | 160     | 0.29  | 160          |
|                            | 1200          | 220  | 15  | 8          | 1218           | 160     | 0.98  | 135          |
|                            | 1500          | 210  | 14  | 8          | 1521           | 195     | 0.75  | 140          |
|                            | 1800          | 210  | 14  | 8          | 1818           | 160     | 0.49  | 160          |
|                            | 2100          | 210  | 18  | 8          | 2117           | 185     | 0.87  | 130          |
|                            |               |      |     |            |                |         |       |              |
| Dec. 15<br>TH 1536         | 0000          | 210  | 15  | 8          | 0017           | 250     | 0.40  | 095          |
|                            | 0300          | 210  | 17  | 8          | 0317           | 280     | 0.49  | 095          |
|                            | 0600          | 210  | 16  | 8          | 0617           | 155     | 0.07  | 170          |
|                            | 0900          | 220  | 20  | 8          | 0717           | 150     | -     | 220          |
|                            | 1200          | 210  | 23  | -          | -              | -       | -     | -            |
|                            | 1500          | 270  | 10  | -          | -              | -       | -     | -            |
|                            | 1800          | 330  | 12  | -          | -              | -       | -     | -            |
|                            | 2100          | 350  | 16  | -          | -              | -       | -     | -            |
|                            |               |      |     |            |                |         |       |              |
| Dec. 16<br>TH 1630         | 0000          | 350  | 12  | -          | -              | -       | -     | -            |
|                            | 0300          | 345  | 9   | -          | -              | -       | -     | -            |
|                            | 0600          | 015  | 7   | -          | -              | -       | -     | -            |
|                            | 0900          | 045  | 3   | -          | -              | -       | -     | -            |
|                            | 1200          | 030  | 3   | -          | -              | -       | -     | -            |
|                            | 1500          | 350  | 4   | 7          | 1538           | 340     | -     | -            |
|                            | 1800          | 000  | 6   | 7          | 1838           | 310     | 0.53  | -            |
|                            | 2100          | 020  | 5   | 7          | 2138           | 240     | 0.62  | -            |

| 1952<br>Dec. 17<br>TH 1727 | Local<br>Time | Wind |      | Dry<br>No. | Trans.<br>Time | Current |       | Wind<br>Tide |
|----------------------------|---------------|------|------|------------|----------------|---------|-------|--------------|
|                            |               | Dir. | mph  |            |                | Dir.    | knots |              |
|                            | 0000          | 130  | 3    | 7          | 0038           | 075     | 0.43  | -            |
|                            | 0300          | 300  | 5    | 7          | 0138           | 175     | 0.07  | -            |
|                            | 0600          | 280  | 10   | 7          | 0638           | 185     | 0.68  | -            |
|                            | 0900          | 300  | 12   | 7          | 0938           | 170     | 0.52  | -            |
|                            | 1200          | 320  | 14   | 7          | 1238           | 185     | 0.60  | -            |
|                            | 1500          | 330  | 15   | 7          | 1537           | 270     | 0.55  | -            |
|                            | 1800          | 330  | 15   | 7          | 1837           | 295     | 0.17  | -            |
|                            | 2100          | 320  | 17   | 7          | 2137           | 150     | 0.60  | -            |
|                            |               |      |      |            |                |         |       |              |
| Dec. 18<br>TH 1827         | 0000          | 320  | 14   | 7          | 0037           | 250     | 0.60  | -            |
|                            | 0300          | 320  | 17   | 7          | 0337           | 215     | 0.45  | -            |
|                            | 0600          | 320  | 14   | 7          | 0637           | 265     | 0.77  | -            |
|                            | 0900          | 310  | 14   | 7          | 0937           | 220     | 0.00  | -            |
|                            | 1200          | 310  | 9    | 7          | 1237           | 185     | 0.78  | -            |
|                            | 1500          | 320  | 10   | 7          | 1537           | 190     | 0.81  | -            |
|                            | 1800          | 320  | 18   | 7          | 1837           | 225     | 0.69  | -            |
|                            | 2100          | 320  | 21   | 7          | 2137           | 235     | 0.00  | -            |
|                            |               |      |      |            |                |         |       |              |
| Dec. 19<br>TH 1928         | 0000          | 320  | 23   | 7          | 0037           | 210     | 0.64  | -            |
|                            | 0300          | 325  | 12   | 7          | 0337           | 255     | 0.70  | -            |
|                            | 0600          | 325  | 18   | 7          | 0637           | 220     | 0.75  | -            |
|                            | 0900          | 325  | 17   | 7          | 0937           | 225     | 0.21  | -            |
|                            | 1200          | 320  | 18   | 7          | 1237           | 195     | 0.76  | -            |
|                            | 1500          | 320  | 18   | 7          | 1537           | 235     | 0.70  | -            |
|                            | 1800          | 320  | 18   | 7          | 1837           | 220     | 0.80  | -            |
|                            | 2100          | 350  | 15   | 7          | 2137           | 190     | 0.18  | -            |
|                            |               |      |      |            |                |         |       |              |
| Dec. 20<br>TH 2028         | 0000          | 350  | 11   | 7          | 0037           | 225     | 0.70  | -            |
|                            | 0300          | 345  | 9    | 7          | 0337           | 190     | 0.70  | -            |
|                            | 0600          | 340  | 6    | 7          | 0637           | 180     | 0.60  | -            |
|                            | 0900          | 340  | 6    | 7          | 0936           | 250     | 0.45  | -            |
|                            | 1200          | 340  | 6    | 7          | 1236           | 225     | 0.31  | -            |
|                            | 1500          | 270  | 2    | 7          | 1536           | 210     | 0.62  | -            |
|                            | 1800          | 270  | 2    | 7          | 1836           | 210     | 0.53  | -            |
|                            | 2100          | 270  | 3    | 7          | 2136           | 240     | 0.55  | -            |
|                            |               |      |      |            |                |         |       |              |
| Dec. 21<br>TH 2121         | 0000          | 270  | 7    | 7          | 0036           | 120     | 0.14  | -            |
|                            | 0300          | 270  | 6    | 7          | 0336           | 145     | 0.07  | -            |
|                            | 0600          | -    | calm | 7          | 0636           | 115     | 0.62  | -            |
|                            | 0900          | 270  | 7    | 7          | 0936           | 095     | 0.59  | -            |
|                            | 1200          | 200  | 15   | 7          | 1236           | 095     | 0.46  | -            |
|                            | 1500          | 195  | 18   | 7          | 1536           | 045     | 0.50  | -            |
|                            | 1800          | 210  | 15   | 7          | 1836           | 045     | 0.28  | -            |
|                            | 2100          | 210  | 16   | 7          | 2136           | 065     | 0.38  | -            |

| 1952<br>Dec. 22<br>TH 2216 | Local<br>Time | Wind |     | Dry<br>No. | Trans.<br>Time | Current |       | Wind<br>Tide |
|----------------------------|---------------|------|-----|------------|----------------|---------|-------|--------------|
|                            |               | Dir. | mph |            |                | Dir.    | knots |              |
|                            | 0000          | 210  | 22  | 7          | 0036           | 065     | 0.64  | -            |
|                            | 0300          | 210  | 22  | 7          | 0336           | 065     | 0.70  | -            |
|                            | 0600          | 210  | 22  | 7          | 0636           | 065     | 0.69  | -            |
|                            | 0900          | 210  | 19  | 7          | 0935           | 095     | 0.35  | -            |
|                            | 1200          | 210  | 22  | 7          | 1235           | 085     | 0.69  | -            |
|                            | 1500          | 210  | 19  | 7          | 1535           | 075     | 0.64  | -            |
|                            | 1800          | 210  | 16  | 7          | 1835           | 095     | 0.69  | -            |
|                            | 2100          | 210  | 15  | 7          | 2135           | 110     | 0.75  | -            |
|                            |               |      |     |            |                |         |       |              |
| Dec. 23<br>TH 2303         | 0000          | 230  | 9   | 7          | 0035           | 090     | 0.36  | -            |
|                            | 0300          | 215  | 6   | 7          | 0335           | 110     | 0.73  | -            |
|                            | 0600          | -    | -   | 7          | 0635           | 125     | 0.60  | -            |
|                            | 0900          | 250  | 4   | 7          | 0935           | 135     | 0.52  | -            |
|                            | 1200          | 260  | 6   | 7          | 1235           | 165     | 0.21  | -            |
|                            | 1500          | 260  | 6   | 7          | 1534           | 105     | 0.13  | -            |
|                            | 1800          | 250  | 6   | -          | -              | -       | -     | -            |
|                            | 2100          | 250  | 9   | 7          | 2134           | 105     | 0.52  | -            |
|                            |               |      |     |            |                |         |       |              |
| Dec. 24<br>TH 2348         | 0000          | 260  | 17  | 7          | 0034           | 230     | 0.52  | -            |
|                            | 0300          | 260  | 20  | 7          | 0334           | 110     | 0.60  | -            |
|                            | 0600          | 250  | 21  | 7          | 0634           | 120     | 0.13  | -            |
|                            | 0900          | 260  | 23  | 7          | 0934           | 095     | 0.70  | -            |
|                            | 1200          | 270  | 12  | 7          | 1234           | 130     | 0.70  | -            |
|                            | 1500          | 030  | 8   | 7          | 1534           | 125     | 0.75  | -            |
|                            | 1800          | 080  | 11  | 7          | 1834           | 345     | 0.34  | -            |
|                            | 2100          | 000  | 10  | 7          | 2134           | 275     | 0.18  | -            |
|                            |               |      |     |            |                |         |       |              |
| Dec. 25                    | 0000          | 000  | 13  | 7          | 0034           | 250     | 0.73  | -            |
|                            | 0300          | 020  | 10  | 7          | 0334           | 285     | 0.70  | -            |
|                            | 0600          | 030  | 9   | 7          | 0634           | 270     | 0.66  | -            |
|                            | 0900          | 045  | 5   | 7          | 0934           | 300     | 0.17  | -            |
|                            | 1200          | 045  | 3   | 7          | 1234           | 315     | 0.43  | -            |
|                            | 1500          | 120  | 3   | 7          | 1534           | 045     | 0.57  | -            |
|                            | 1800          | 180  | 7   | 7          | 1834           | 065     | 0.53  | -            |
|                            | 2100          | 210  | 12  | 7          | 2134           | 065     | 0.49  | -            |
|                            |               |      |     |            |                |         |       |              |
| Dec. 26<br>TH 0029         | 0000          | 210  | 22  | 7          | 0034           | 065     | 0.41  | -            |
|                            | 0300          | 210  | 20  | 7          | 0334           | 130     | 0.20  | -            |
|                            | 0600          | 210  | 32  | 7          | 0634           | 075     | 0.74  | -            |
|                            | 0900          | 250  | 15  | 7          | 0932           | 105     | 0.71  | -            |
|                            | 1200          | 320  | 12  | 7          | 1232           | 175     | 0.73  | -            |
|                            | 1500          | 320  | 11  | 7          | 1532           | 190     | 0.07  | -            |
|                            |               |      |     |            |                |         |       |              |
| 1952<br>Dec. 30<br>TH 0313 | 0000          | 250  | 14  | -          | -              | -       | -     | -            |
|                            | 0300          | 270  | 9   | -          | -              | -       | -     | -            |
|                            | 0600          | 270  | 8   | -          | -              | -       | -     | -            |
|                            | 0900          | 260  | 7   | -          | -              | -       | -     | -            |
|                            | 1200          | 270  | 9   | 6          | 1346           | 115     | 0.66  | 280          |
|                            | 1500          | 270  | 7   | 6          | 1527           | 130     | 0.46  | 280          |
|                            | 1800          | 250  | 6   | 6          | 1646           | 150     | 0.07  | 225          |
|                            | 2100          | 250  | 6   | 6          | 1827           | 145     | 0.85  | 225          |
|                            |               |      |     |            |                |         |       |              |
| Dec. 31<br>TH 0359         | 0000          | 250  | 6   | 6          | 1946           | 275     | 0.71  | 180          |
|                            | 0300          | 250  | 6   | 6          | 2127           | 255     | 0.59  | 175          |
|                            | 0600          | 250  | 6   | 6          | 2246           | 255     | 0.71  | 175          |
|                            | 0900          | 250  | 12  | 6          | 0027           | 130     | 0.67  | 230          |
|                            | 1200          | 250  | 8   | 6          | 0146           | 090     | 0.57  | 230          |
|                            | 1500          | 250  | 8   | 6          | 0327           | 355     | 0.50  | 080          |
|                            | 1800          | 250  | 12  | 6          | 0446           | 090     | 0.20  | 355          |
|                            | 2100          | 250  | 12  | 6          | 0627           | 090     | 0.27  | 355          |
|                            |               |      |     |            |                |         |       |              |
| 1953<br>Jan. 1<br>TH 0448  | 0000          | 250  | 18  | 6          | 0746           | 065     | 0.77  | 000          |
|                            | 0300          | 250  | 18  | 6          | 0946           | 095     | 0.66  | 240          |
|                            | 0600          | 250  | 22  | 6          | 1046           | 105     | 0.66  | 240          |
|                            | 0900          | 250  | 22  | 6          | 1228           | 115     | 0.70  | 240          |

1954  
Jan. 2  
TN 0540

| Local Time | Wind dir. mph | Baro. No. | Trans. Time | Current dir. knots | Wind Vane |
|------------|---------------|-----------|-------------|--------------------|-----------|
| 0000       | 306 13        | 6         | 0030        | 105 0.63           | 295       |
| 0300       | 330 13        | 6         | 0151        | 120 0.11           | 355       |
| 0600       | 330 13        | 6         | 0330        | 095 0.48           | 045       |
| 0900       | 340 11        | 6         | 0451        | 120 0.00           | 355       |
| 1200       | 340 9         | 6         | 0630        | 120 0.59           | 025       |
| 1500       | 030 7         | 6         | 0751        | 120 0.63           | 355       |
| 1800       | 050 3         | 6         | 0932        | 125 0.67           | 295       |
| 2100       | - calm        | 6         | 1053        | 130 0.71           | 355       |
|            |               | 6         | 1232        | 160 0.70           | 030       |
|            |               | 6         | 1353        | 140 0.72           | 295       |
|            |               | 6         | 1532        | 165 0.24           | 040       |
|            |               | 6         | 1653        | 175 1.06           | 025       |
|            |               | 6         | 1832        | 205 0.70           | 000       |
|            |               | 6         | 1953        | 185 0.63           | 040       |
|            |               | 6         | 2132        | 195 0.70           | 045       |
|            |               | 6         | 2253        | 145 0.77           | 125       |

Jan. 3  
TN 0636

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | - calm | 6 | 0032 | 205 0.63 | 125 |
| 0300 | - calm | 6 | 0253 | 165 0.15 | 170 |
| 0600 | 060 1  | 6 | 0332 | 205 0.35 | 115 |
| 0900 | 120 3  | 6 | 0453 | 220 0.60 | 100 |
| 1200 | 120 12 | 6 | 0632 | 210 0.81 | 140 |
| 1500 | 300 4  | 6 | 0832 | 270 0.71 | 055 |
| 1800 | 210 20 | 6 | 1053 | 210 0.79 | 080 |
| 2100 | 200 19 | 6 | 1232 | 205 0.67 | 025 |
|      |        | 6 | 1354 | 295 0.11 | 035 |
|      |        | 6 | 1534 | 285 0.67 | 060 |
|      |        | 6 | 1654 | 305 0.66 | 025 |
|      |        | 6 | 1834 | 045 0.59 | 355 |
|      |        | 6 | 1954 | 340 0.63 | 355 |
|      |        | 6 | 2134 | 380 0.70 | 015 |
|      |        | 6 | 2254 | 045 0.85 | 185 |

Jan. 4  
TN 0732

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 210 19 | 6 | 0034 | 045 0.59 | 355 |
| 0300 | 210 22 | 6 | 0154 | 030 0.14 | 355 |
| 0600 | 210 19 | 6 | 0334 | 350 0.35 | 355 |
| 0900 | 210 20 | 6 | 0454 | 005 0.77 | 010 |
| 1200 | 210 23 | 6 | 0634 | 340 0.67 | 085 |
| 1500 | 210 19 | 6 | 0834 | 055 0.77 | 060 |
| 1800 | 240 7  | 6 | 1054 | 011 -    | 021 |
| 2100 | 000 9  | 6 | 1234 | 015 0.63 | 250 |
|      |        | 6 | 1354 | 045 0.77 | 356 |
|      |        | 6 | 1534 | 030 0.08 | -   |
|      |        | 6 | 1654 | 005 1.68 | 002 |
|      |        | 6 | 1834 | - 0.11   | -   |
|      |        | 6 | 1954 | 102 1.67 | 356 |
|      |        | 6 | 2134 | 110 0.08 | -   |
|      |        | 6 | 2254 | 212 -    | 097 |

1954  
Jan. 5  
TN 0824

| Local Time | Wind dir. mph | Baro. No. | Trans. Time | Current dir. knots | Wind Vane |
|------------|---------------|-----------|-------------|--------------------|-----------|
| 0000       | 020 8         | 6         | 0036        | 301 0.35           | -         |
| 0300       | 035 4         | 6         | 0156        | 212 0.20           | -         |
| 0600       | 040 5         | 6         | 0336        | 147 1.40           | 059       |
| 0900       | 038 4         | 6         | 0456        | 175 0.35           | 000       |
| 1200       | 085 5         | 6         | 0636        | 298 0.85           | 041       |
| 1500       | 063 5         | 6         | 0756        | 297 0.77           | 042       |
| 1800       | 090 10        | 6         | 0936        | 295 0.67           | 105       |
| 2100       | 120 14        | 6         | 1056        | 270 0.53           | 354       |
|            |               | 6         | 1236        | 212 0.63           | 048       |
|            |               | 6         | 1356        | 212 0.00           | 059       |
|            |               | 6         | 1536        | 339 0.66           | 012       |
|            |               | 6         | 1656        | 264 0.69           | 012       |
|            |               | 6         | 1836        | 244 0.73           | 042       |
|            |               | 6         | 2016        | 270 0.41           | 026       |

Jan. 6  
TN 0923

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 170 17 | 6 | 0042 | 270 0.11 | 011 |
| 0300 | 180 19 | 6 | 0200 | 297 0.27 | -   |
| 0600 | 185 19 | 6 | 0342 | 311 -    | 000 |
| 0900 | 220 14 | 6 | 0500 | 330 0.62 | 354 |
| 1200 | 225 9  | 6 | 0642 | 221 0.62 | 358 |
| 1500 | 260 6  | 6 | 0800 | 330 0.59 | 018 |
| 1800 | 225 14 | 6 | 0942 | 005 0.74 | 352 |
| 2100 | 225 14 | 6 | 1100 | 201 0.81 | 000 |
|      |        | 6 | 1242 | 032 0.56 | 000 |
|      |        | 6 | 1400 | 076 0.27 | 020 |
|      |        | 6 | 1542 | 076 0.66 | 338 |
|      |        | 6 | 1700 | 060 0.62 | -   |
|      |        | 6 | 1842 | 100 0.61 | 336 |
|      |        | 6 | 2000 | 041 0.60 | -   |

Jan. 7  
TN 1015

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 220 24 | - | -    | -        | -   |
| 0300 | 215 26 | - | -    | -        | -   |
| 0600 | 210 20 | - | -    | -        | -   |
| 0900 | 200 26 | - | -    | -        | -   |
| 1200 | 305 15 | 6 | 0942 | 153 -    | 000 |
| 1500 | 305 15 | 6 | 1100 | 121 0.63 | 338 |
| 1800 | 315 16 | 6 | 1242 | 119 0.21 | 000 |
| 2100 | 315 20 | 6 | 1400 | 152 -    | 338 |
|      |        | 6 | 1542 | 130 -    | 338 |
|      |        | 6 | 1700 | 092 -    | 000 |
|      |        | 6 | 1800 | 066 0.27 | -   |

1954  
Jan. 8  
TN 1105

| Local Time | Wind dir. mph | Baro. No. | Trans. Time | Current dir. knots | Wind Vane |
|------------|---------------|-----------|-------------|--------------------|-----------|
| 0000       | 315 20        | 6         | 0042        | 005 0.88           | 338       |
| 0300       | 320 19        | 6         | 0200        | 100 0.11           | 000       |
| 0600       | 330 20        | 6         | 0342        | 110 0.43           | 000       |
| 0900       | 330 22        | 6         | 0500        | 154 0.56           | 281       |
| 1200       | 330 20        | 6         | 0642        | 160 -              | 275       |
| 1500       | 330 20        | 6         | 0800        | 182 0.10           | 000       |
| 1800       | 330 20        | 6         | 0942        | 131 0.74           | 000       |
| 2100       | 330 20        | 6         | 1100        | 103 0.77           | 000       |
|            |               | 6         | 1242        | 155 0.90           | 000       |
|            |               | 6         | 1400        | 158 0.97           | 338       |
|            |               | 6         | 1542        | 160 0.27           | 000       |

Jan. 9  
TN 1154

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 330 19 | - | -    | -        | -   |
| 0300 | 330 13 | 6 | 0500 | 270 -    | 000 |
| 0600 | 345 15 | 6 | 0642 | 192 0.43 | 000 |
| 0900 | 000 10 | 6 | 0800 | 168 0.56 | 357 |
| 1200 | 000 13 | 6 | 1000 | 211 0.63 | 338 |
| 1500 | 000 7  | 6 | 1200 | 202 0.85 | 000 |
| 1800 | 010 5  | 6 | 1400 | 230 0.56 | 000 |
| 2100 | - calm | 6 | 1600 | 168 0.77 | -   |
|      |        | 6 | 1800 | 239 0.64 | 224 |
|      |        | 6 | 2000 | 160 0.56 | 085 |
|      |        | 6 | 2128 | 097 0.56 | 085 |

Jan. 10  
TN 1243

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | - calm | - | -    | -        | -   |
| 0300 | - calm | - | -    | -        | -   |
| 0600 | 225 6  | - | -    | -        | -   |
| 0900 | 225 7  | - | -    | -        | -   |
| 1200 | 220 10 | 6 | 1248 | 330 -    | 356 |
| 1500 | 190 12 | 6 | 1400 | 329 0.55 | 356 |
| 1800 | 190 14 | 6 | 1548 | 350 0.69 | 000 |
| 2100 | 185 17 | 6 | 1700 | 358 0.55 | 000 |

Jan. 11  
TN 1333

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 185 14 | - | -    | -        | -   |
| 0300 | 195 20 | - | -    | -        | -   |
| 0600 | 220 21 | - | -    | -        | -   |
| 0900 | 225 17 | 6 | 0951 | 349 -    | 354 |
| 1200 | 220 20 | 6 | 1100 | 005 1.62 | 000 |
| 1500 | 210 21 | 6 | 1313 | 357 0.15 | 000 |
| 1800 | 200 16 | 6 | 1522 | 008 0.80 | 351 |
| 2100 | 200 16 | - | -    | 008 0.83 | 000 |

Jan. 12  
TN 1425

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 190 21 | - | -    | -        | -   |
| 0300 | 190 21 | 6 | 0342 | 026 -    | 000 |
| 0600 | 240 26 | 6 | 0500 | 027 0.71 | 000 |
| 0900 | 245 26 | 6 | 0642 | 027 0.76 | 139 |
| 1200 | 270 8  | 6 | 0800 | 008 0.88 | 003 |
| 1500 | 250 10 | 6 | 0953 | 041 0.11 | 352 |
| 1800 | 245 8  | 6 | 1144 | 103 0.83 | 008 |
| 2100 | 270 8  | 6 | 1253 | 028 0.46 | 358 |
|      |        | 6 | 1414 | 060 0.66 | 301 |
|      |        | 6 | 1553 | 078 0.88 | 150 |
|      |        | 6 | 1705 | 103 -    | -   |
|      |        | 6 | 1853 | 121 0.21 | 357 |
|      |        | 6 | 2015 | - 1.16   | 003 |

Jan. 13  
TN 1519

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 300 11 | 6 | 0052 | 060 0.49 | 042 |
| 0300 | 300 12 | 6 | 0353 | 152 0.49 | 244 |
| 0600 | 310 14 | 6 | 0515 | 152 1.10 | 244 |
| 0900 | 335 21 | 6 | 0653 | 121 0.84 | 000 |
|      |        | 6 | 0815 | 010 0.15 | 000 |
|      |        | 6 | 0953 | 264 0.70 | 098 |
|      |        | 6 | 1015 | 264 0.76 | 221 |

Jan. 26  
TN 0107

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 355 13 | - | -    | -        | -   |
| 0300 | 030 11 | - | -    | -        | -   |
| 0600 | 030 7  | - | -    | -        | -   |
| 0900 | 040 6  | - | -    | -        | -   |
| 1200 | 045 7  | 9 | 1245 | 293 0.35 | 026 |
| 1500 | 070 6  | 9 | 1545 | - 0.56   | 332 |
| 1800 | 095 4  | 9 | 1845 | 011 0.66 | 350 |
| 2100 | 090 4  | 9 | 2145 | 031 0.71 | 305 |

Jan. 27  
TN 0151

|      |        |   |      |          |     |
|------|--------|---|------|----------|-----|
| 0000 | 090 5  | 9 | 0047 | 328 0.20 | 312 |
| 0300 | 090 4  | 9 | 0347 | 063 0.52 | 286 |
| 0600 | 100 4  | 9 | 0647 | 048 0.57 | 287 |
| 0900 | 105 5  | 9 | 0946 | 045 0.66 | 311 |
| 1200 | 100 6  | 9 | 1246 | 005 0.49 | 260 |
| 1500 | 090 3  | 9 | 1545 | 334 0.34 | 328 |
| 1800 | - calm | 9 | 1845 | 350 0.59 | 336 |
| 2100 | - calm | 9 | 2145 | 034 1.54 | 348 |

1954  
Feb. 8  
TN 1221

| Local Time | Wind dir. mph | Baro. No. | Trans. Time | Current dir. knots | Wind Vane |
|------------|---------------|-----------|-------------|--------------------|-----------|
| 0000       | 280 10        | -         | -           | -                  | -         |
| 0300       | -             | -         | -           | -                  | -         |
| 0600       | -             | -         | -           | -                  | -         |
| 0900       | -             | -         | -           | -                  | -         |
| 1200       | 150 7         | -         | -           | -                  | -         |
| 1500       | 140 14        | 14        | 1637        | 307 -              | 000       |
| 1800       | 180 17        | 14        | 1937        | 001 0.72           | 000       |
| 2100       | 225 24        | 14        | 2043        | 359 0.45           | 314       |

Feb. 9  
TN 1315

|      |        |    |      |          |     |
|------|--------|----|------|----------|-----|
| 0000 | 265 26 | -  | -    | -        | -   |
| 0300 | 270 50 | -  | -    | -        | -   |
| 0600 | 260 43 | -  | -    | -        | -   |
| 0900 | 265 30 | 14 | 1040 | 100 -    | 000 |
| 1200 | 270 18 | 14 | 1345 | 095 0.96 | 270 |
| 1500 | 270 18 | 14 | 1645 | 096 1.08 | 280 |
| 1800 | 280 20 | -  | -    | 140 1.08 | 336 |
| 2100 | 280 23 | -  | -    | -        | -   |

# NOTES ON TABLE I

Buoys 8, 9, and 14 were all rigged as shown in Figure 2; buoys 6 and 7 were rigged with the deep drag on a bridle directly beneath the can; buoys 2, 3, and 4 were rigged the same as Figure 2, but the deep drag was replaced by another rotor similar to that at the surface. The depth of the deep drag, of the surface rotor, and the Magnus correction applied in determining current direction from the rough data, were as follows:

| Buoy No. | Depth of<br>deep drag<br>(or rotor)<br>(feet) | Depth of<br>surface<br>rotor<br>(feet) | Current<br>direction<br>correction |
|----------|-----------------------------------------------|----------------------------------------|------------------------------------|
| 2        | 150                                           | 8                                      | -10°                               |
| 3        | 200                                           | 8                                      | -10°                               |
| 4        | 150                                           | 8                                      | -10°                               |
| 6        | 170                                           | 8                                      | unknown                            |
| 7        | 120                                           | 8                                      | -25°                               |
| 8        | 530                                           | 13                                     | -10°                               |
| 9        | 150                                           | 8                                      | +10°                               |
| 14       | 300                                           | 10                                     | +10°                               |

It is probable that there is a systematic error in all angles measured by buoy 6.

The notation "TM" means the Bermuda Time (GMT - 4 hours) of Greenwich upper transit of the moon. The anemometers on the buoys were so unreliable (due to circuit troubles) that all of their data is omitted. Winds tabulated are those on a 50 foot mast at the observatory at Bermuda. The exposure was not ideal, there being several hills, and a large building in the neighborhood. Particularly, the anemometer is partly sheltered from west winds.

The notation "Trans. Time" means the Bermuda time at which the buoy

wireless transmission was received. The current direction is the instantaneous magnetic direction of the surface current (vectorial difference of surface and deep) with the above corrections applied. The current speed is an average for the previous three hours (in the case of buoy 6, 90 minutes).

The figures under "Wind Vane" are angle between the geographical orientation of the buoy and the wind direction measured by the vane on the buoy. Thus an angle of  $000^{\circ}$  means that the instantaneous wind and uncorrected current vectors point in the same direction; an angle of  $030^{\circ}$  means the uncorrected current is  $30^{\circ}$  to the left of the wind; an angle of  $320^{\circ}$  means the uncorrected current is  $40^{\circ}$  to the right of the wind.

TABLE II

TOTAL NUMBER OF WAVE READINGS (COMBINED)  
FOR EACH 10° ANGLE OF DEVIATION OF  
CURRENT FROM WIND

Days 2, 3, 4, and 8

|       |      |       |     |
|-------|------|-------|-----|
| 170 R | 4    | 010 L | 274 |
| 160 R | 6    | 020 L | 288 |
| 150 R | 7    | 030 L | 297 |
| 140 R | 18   | 040 L | 307 |
| 130 R | 25   | 050 L | 309 |
| 120 R | 30   | 060 L | 311 |
| 110 R | 32   | 070 L | 314 |
| 100 R | 46   | 080 L | 318 |
| 090 R | 56   | 090 L | 320 |
| 080 R | 68   | 100 L | 322 |
| 070 R | 79   | 110 L | 325 |
| 060 R | 103  | 120 L | 330 |
| 050 R | 121  | 130 L | 337 |
| 040 R | 141  | 140 L | 338 |
| 030 R | 151  | 150 L | 340 |
| 020 R | 172* | 160 L | 341 |
| 010 R | 192  | 170 L | 345 |
| 000   | 223  |       |     |

\*Half the readings are on either side of this point.

TABLE III

24-HOUR VECTORIAL MEANS OF CURRENT AND WINDS  
FOR DAYS WITH STEADY WINDS

| Day      | Boat | Wind<br>blow<br>toward | Wind<br>speed<br>(knots) | Current<br>Direction | Current<br>Speed<br>(knots) | Angle of current<br>relative to wind<br>Method (1) | Method (2) |
|----------|------|------------------------|--------------------------|----------------------|-----------------------------|----------------------------------------------------|------------|
| Oct. 29  | 3    | 018                    | 20.0                     | 060                  | 1.09                        | 042 R                                              | 070 R      |
| 29       | 4    | 018                    | 20.0                     | 070                  | 0.70                        | 052 R                                              | 000        |
| Nov. 3   | 3    | 225                    | 6.1                      | 230                  | 0.22                        | 025 R                                              | 035 R      |
| 6        | 3    | 305                    | 11.2                     | 345                  | 0.64                        | 040 R                                              | 045 R      |
| 8        | 3    | 230                    | 4.4                      | 235                  | 0.72                        | 005 R                                              | 040 R      |
| 9        | 3    | 270                    | 4.5                      | 270                  | 0.57                        | 000                                                | 055 R      |
| 23(1)    | 2    | 285                    | 11.2                     | 315                  | 0.45                        | 030 R                                              | 010 R      |
| 24       | 2    | 335                    | 6.0                      | 335                  | 0.54                        | 020                                                | 040 R      |
| 26       | 2    | 015                    | 13.0                     | 030                  | 0.57                        | 015 R                                              | 005 R      |
| Dec. 2-3 | 2    | 190                    | 13.0                     | 170                  | 0.50                        | 080 R                                              | 020 R      |
| 5        | 8    | 270                    | 3.0                      | (2)                  | 0.08                        | (2)                                                | (2)        |
| 6        | 6    | 260                    | 4.0                      | (2)                  | 0.18                        | (2)                                                | (2)        |
| 18       | 7    | 160                    | 13.0                     | 220                  | 0.61                        | 080 R                                              | (5)        |
| 19       | 7    | 145                    | 14.0                     | 225                  | 0.67                        | 080 R                                              | (5)        |
| 22       | 7    | 030                    | 17.0                     | 075                  | 0.69                        | 045 R                                              | (5)        |
| 23       | 7    | 060                    | 6.0                      | 115                  | 0.48                        | 055 R                                              | (5)        |
| Jan. 1   | 5    | 155                    | 12.0                     | (3)                  | 0.70                        | (3)                                                | (3)        |
| 3-4      | 6    | 030                    | 17.0                     | (3)                  | 0.50                        | (3)                                                | (3)        |
| 8        | 6    | 190                    | 18.0                     | (3)                  | 0.68                        | (3)                                                | (3)        |
| 11(4)    | 6    | 025                    | 18.0                     | (4)                  | 0.72                        | (3)                                                | (3)        |
| 26-27    | 9    | 270                    | 4.0                      | 010                  | 0.48                        | 100 R                                              | 055 R      |
| Feb. 9   | 14   | 270                    | 23.0                     | (4)                  | 1.45                        | (4)                                                | 045 R      |

(1) Current data not available for entire 24 hours, but winds blew steady for previous four days.

(2) Mean direction meaningless because of large oscillatory motions.

(3) Angles have unknown systematic errors due to faulty bridging of Boat 6.

(4) Current data not available for entire 24 hours.

(5) Wind vanes broken.

TABLE IV

INERTIAL AMPLITUDES AND PHASE FOR DAYS SHOWING 24-HOUR  
ROTATORY CURRENTS. ALL CASES ARE CUN SOLA.

| Day     | Boat | Amplitude<br>(knots) | Time of Maximum<br>Northerly Flow<br>Local Mean<br>Solar Time | Greenwich<br>Lunar Time |
|---------|------|----------------------|---------------------------------------------------------------|-------------------------|
| Oct. 29 | 3    | 0.20                 | 1500                                                          | 1310                    |
| 30      | 3    | 0.25                 | 0930                                                          | 0530                    |
| Nov. 1  | 3    | 0.13                 | 0430                                                          | 0030                    |
| 5       | 3    | 0.10                 | 2030                                                          | 1400                    |
| 9       | 3    | 0.10                 | 1330                                                          | 0130                    |
| 25      | 2    | 0.06                 | 0000                                                          | 0030                    |
| 27      | 2    | 0.25                 | 0000                                                          | 2230                    |
| Dec. 6  | 8    | 0.25                 | 0730                                                          | 2330                    |
| 7       | 8    | 0.20                 | 0630                                                          | 2145                    |
| 23      | 7    | 0.10                 | 0900                                                          | 1000                    |
| 24      | 7    | 0.25                 | 1300                                                          | 1330                    |
| 26      | 7    | 0.06                 | 1100                                                          | 1200                    |
| Jan. 4  | 6    | 0.20                 | 0730                                                          | 0400                    |
| 6       | 6    | 0.20                 | 0900                                                          | 2330                    |

#### LEGENDS FOR FIGURES

Fig. 1. Tracks of the various buoys around Bermuda. Contours of the 100 and 1000 fathom lines are drawn in about the island. The tracks of different buoys are shown by different qualities of line. The Roman numerals indicate the month and the numbers immediately following them the day. Tracks ending in shallow water show buoys that came ashore. Tracks pointing off the chart indicate buoys which drifted out of radio-direction-finding range but which were still able to telemeter data properly.

Fig. 2. Schematic sketch of the buoy showing the radio mast and meteorological instruments above water, the current rotor and the deep drag each attached to ends of the outrigger arms.

Fig. 3. Detailed sketch of the construction of the rotor.

Fig. 4. Sample bathythermograph soundings showing the mixed water conditions prevailing through most of the period of measurement.

Fig. 5. Sample daily records of wind and current showing the response of the current to a strong wind and the aftereffects following it.

Fig. 6. Logarithmic graph of mean wind against mean surface current for days with steady wind. The solid line has slope of 1.0; the dashed line, slope of 1.5.

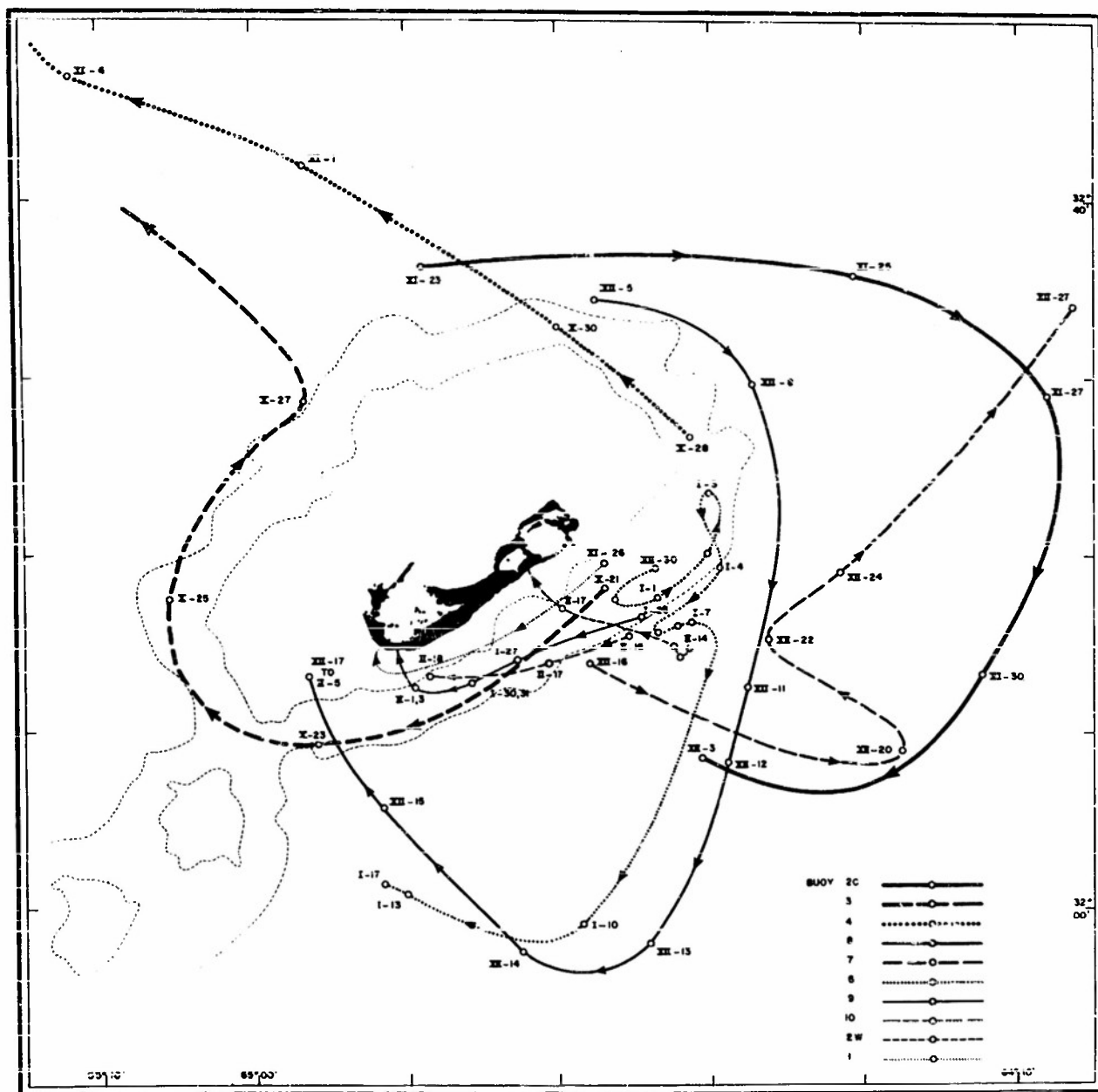


FIG.1

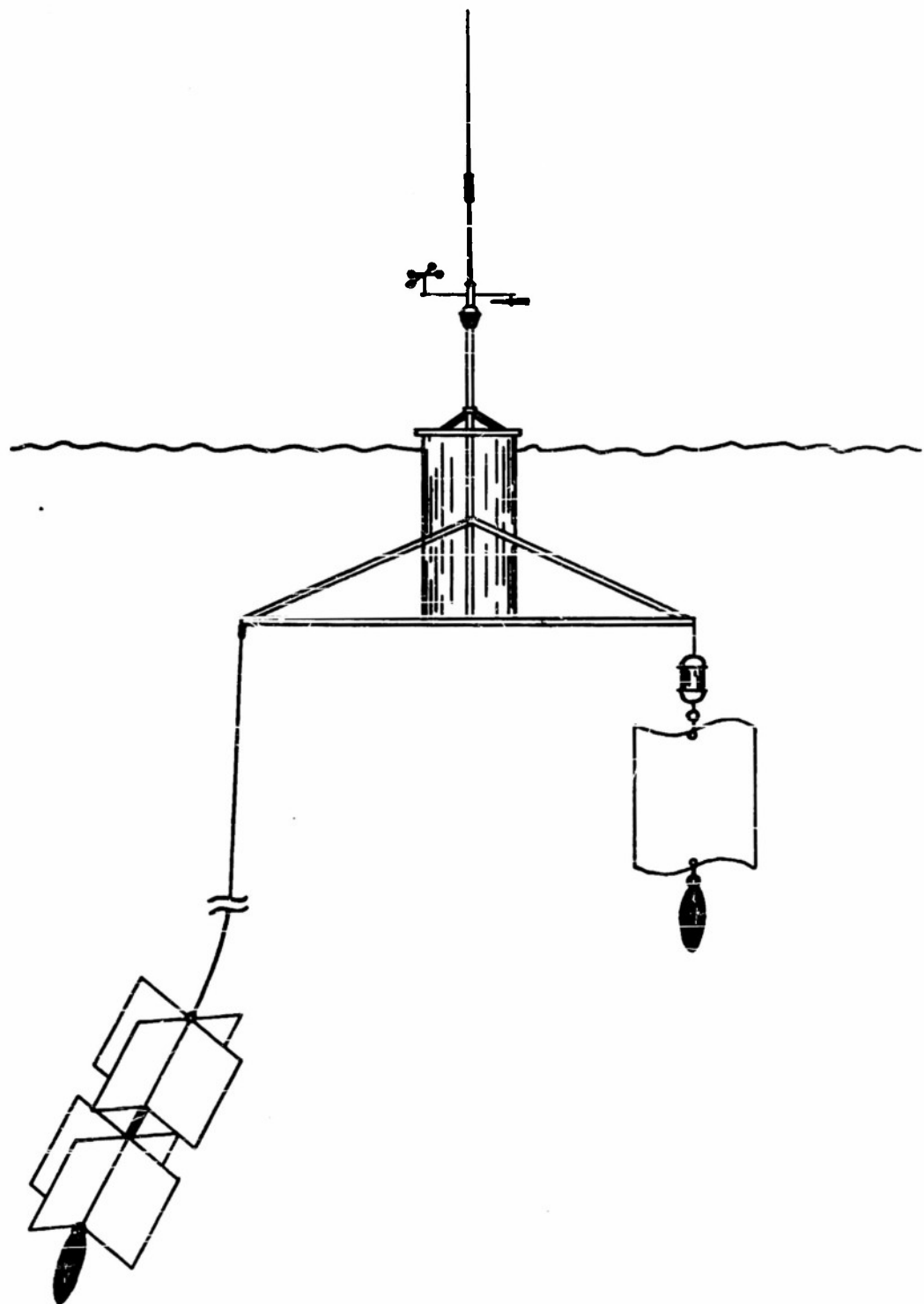
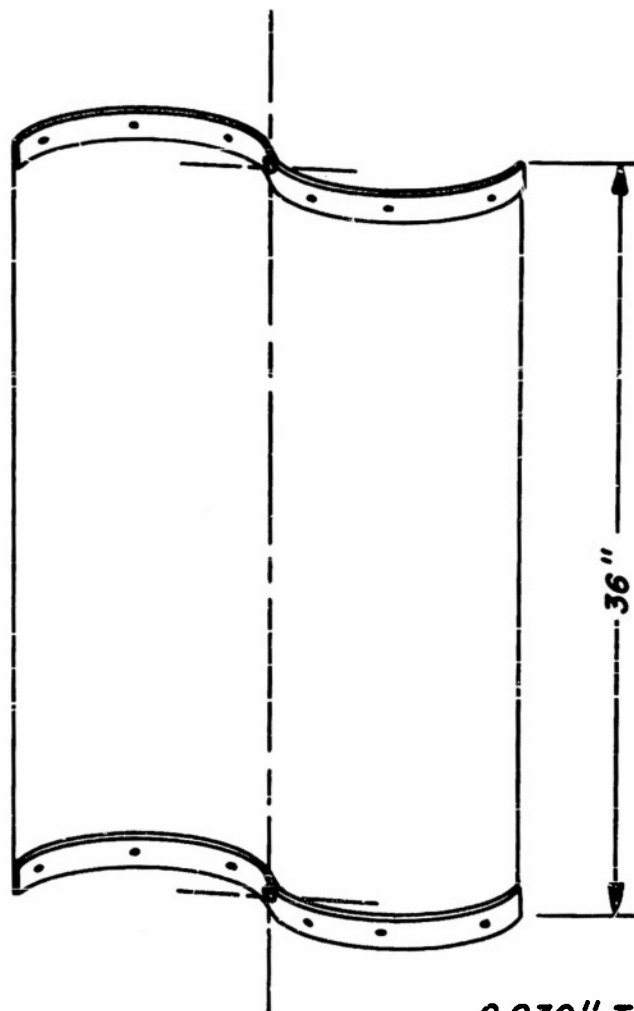


FIG. 2



0.030" THICK  
GALV. IRON SHEET

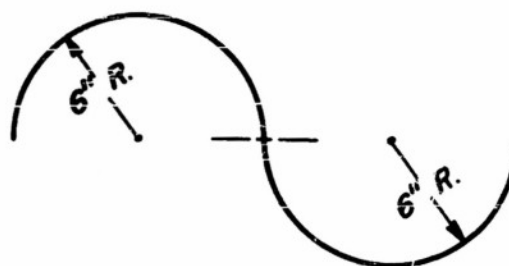


FIG.3

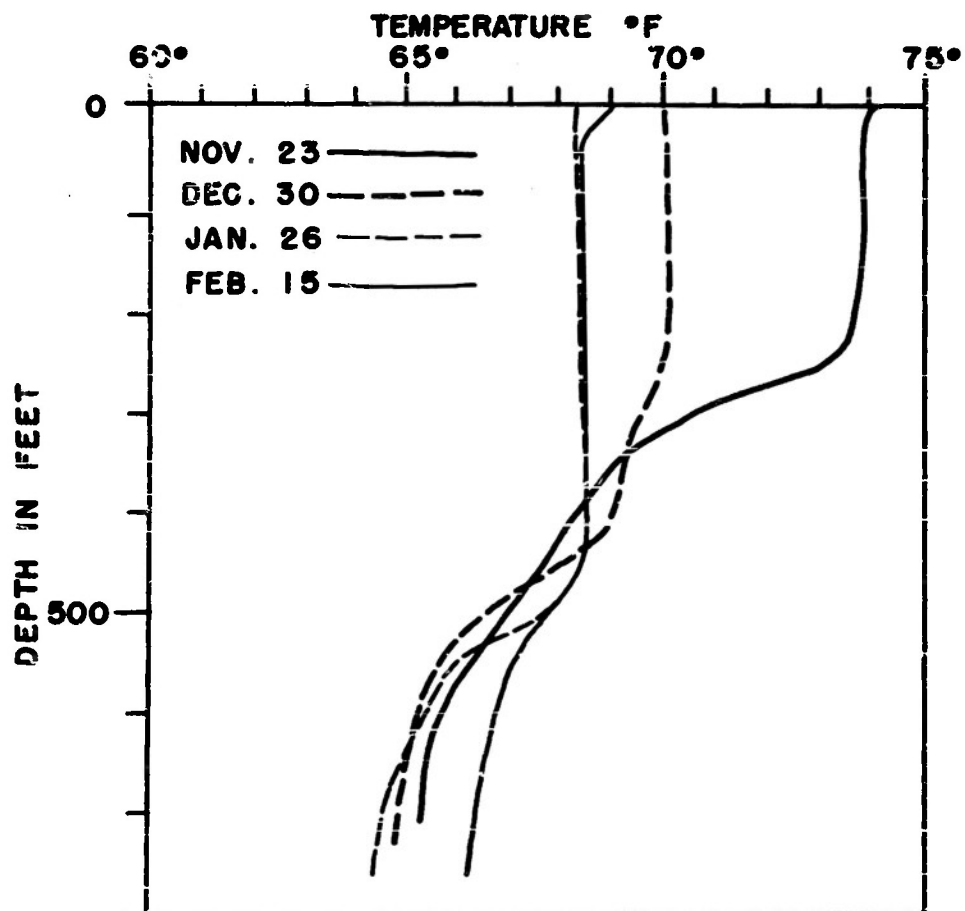


FIG. 4

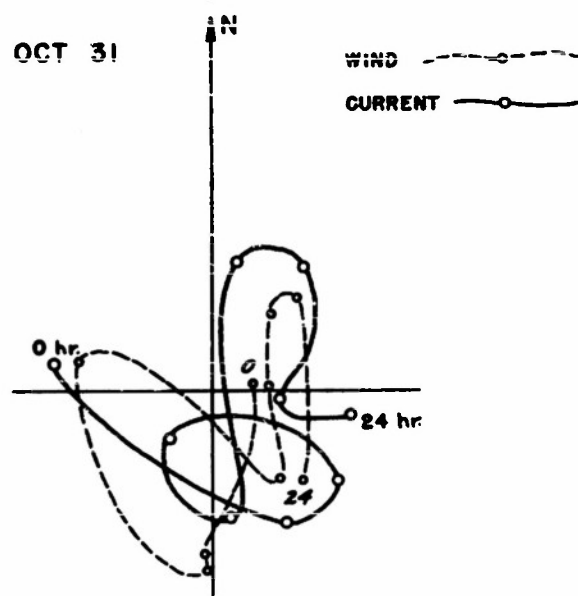
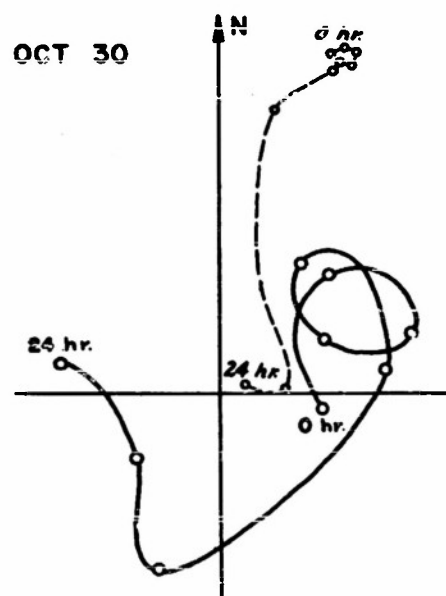
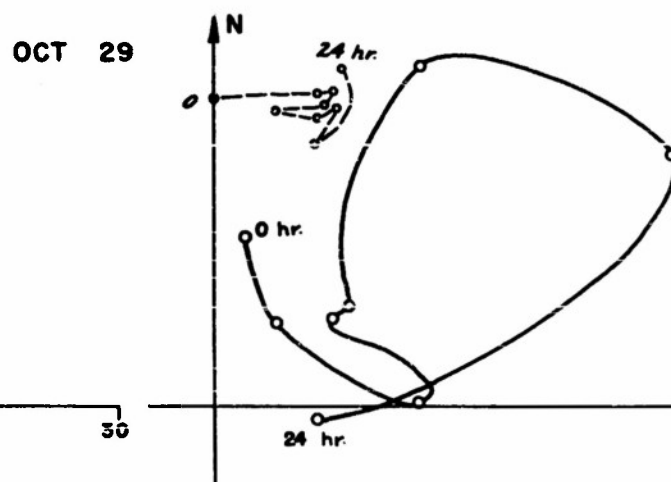
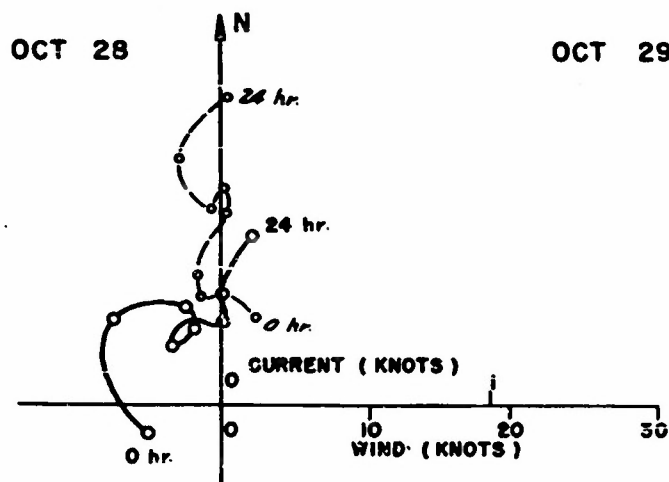


FIG. 5

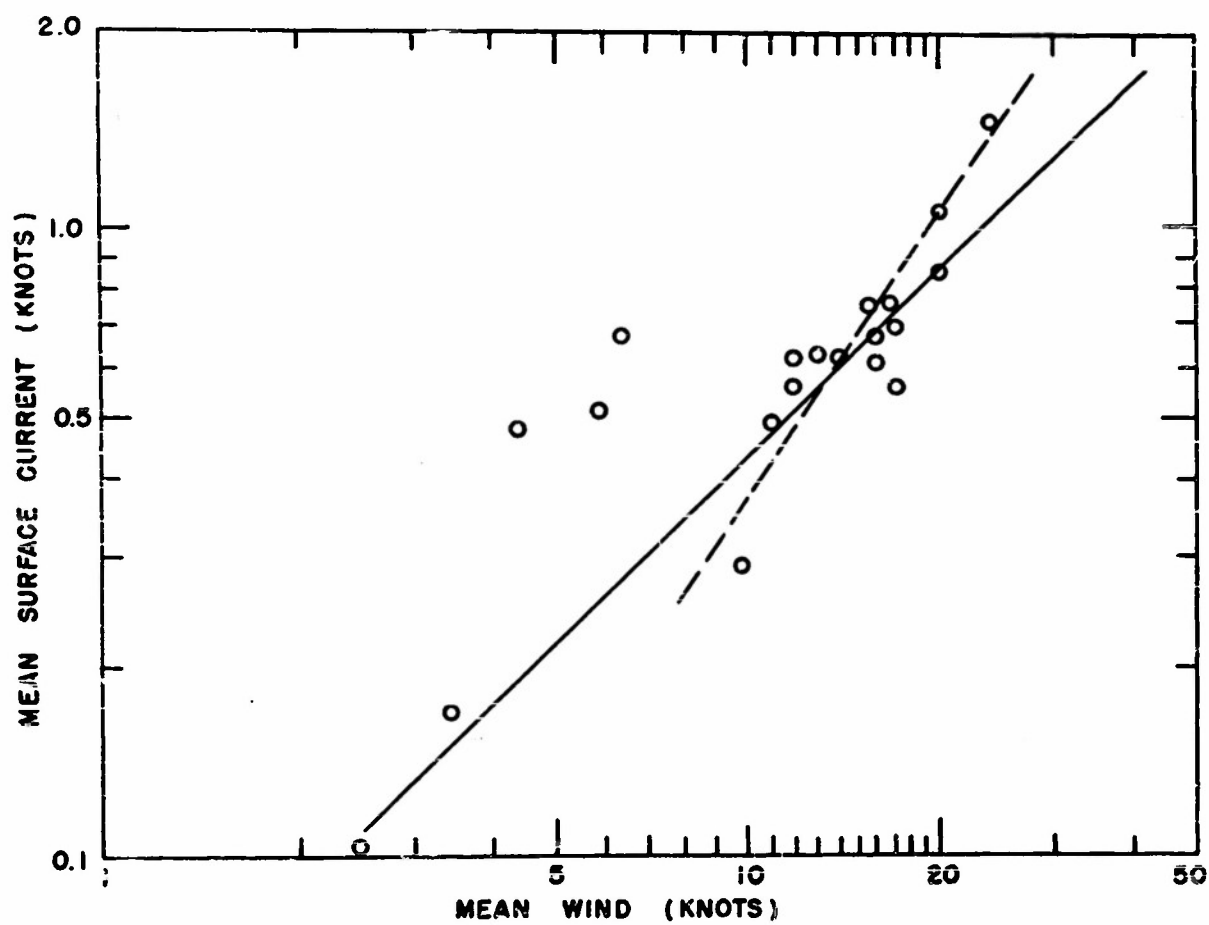


FIG. 6

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