

Weather Note

THE SOUTHEASTER IN NEW ENGLAND WATERS, AUGUST 22-23, 1965

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The author was a member of the crew of the 42-ft. ketch *Holger Danske*, John Wilson, owner-skipper, in the Chandler Hovey Ocean Race in August 1965. The start was off Marblehead, Mass., at approximately 1800 GMT on Saturday August 21. The approximate course of the vessel is shown in figure 1.

Generally, the race was a slow one. As a subjective estimate, there was too little wind 80 percent of the time, just enough 10 percent of the time, and more than any of us wanted 10 percent of the time. Unfortunately the excess came in the form of a southeaster near the end of the race, at night, accompanied by reduced visibility from rain and fog and a surprisingly heavy sea. The necessity of beating to windward around Thatcher Island in these conditions, lateness of the hour, and crew commitments for the following day, led to abandonment of the race by *Holger Danske* at about 0300 GMT on Sunday August 23, followed by a return to Marblehead under sail and power and arrival at about 0730 GMT. Of the eleven yachts starting, seven withdrew for a variety of reasons. The winner was Ted Hood in his yawl, *Robin*; he managed to find wind farther out to sea on the 22d, did not become becalmed, and finished at about 2100 GMT of that date.

The author monitored the FAA broadcast from Logan Airport, Boston, on 382 kc./sec., and prepared maps operationally at 2-hr. intervals, using the 14 New England hourly airways observations transmitted on tape. These maps (not shown) probably provided a better basis for anticipation of developments than the general or marine forecasts of the Weather Bureau at Boston, though the latter were correct in a general way, calling for southeasterly winds 10 to 20 kt. and intermittent rain during the day and evening Sunday. Neither source of information, however, provided much insight into the crucial details of the weather and sea conditions which had such an important bearing on this race.

Consequently a close analysis of this situation seemed appropriate. The large-scale picture (figs. 2) showed an anticyclone moving eastward across New England, followed by a weak east coast secondary cyclone forming on a diffuse warm front extending to sea from the Mid-Atlantic States. At 500 mb. the flow was essentially westerly with small vorticity changes throughout the

period. (The 500-mb. absolute vorticity near Cape Porpoise varied between 11.0 and $12.5 \times 10^{-5} \text{ sec.}^{-1}$.) Thus the cyclogenesis was a strictly low-level affair, and the ascent producing the rain was attributable to low-level warm advection.

A series of detailed analyses for New England at 3-hr. intervals was prepared for the interval from 1500 GMT on the 21st to 0000 GMT on the 23d from data from all 30 hourly stations in the region, plus available observations

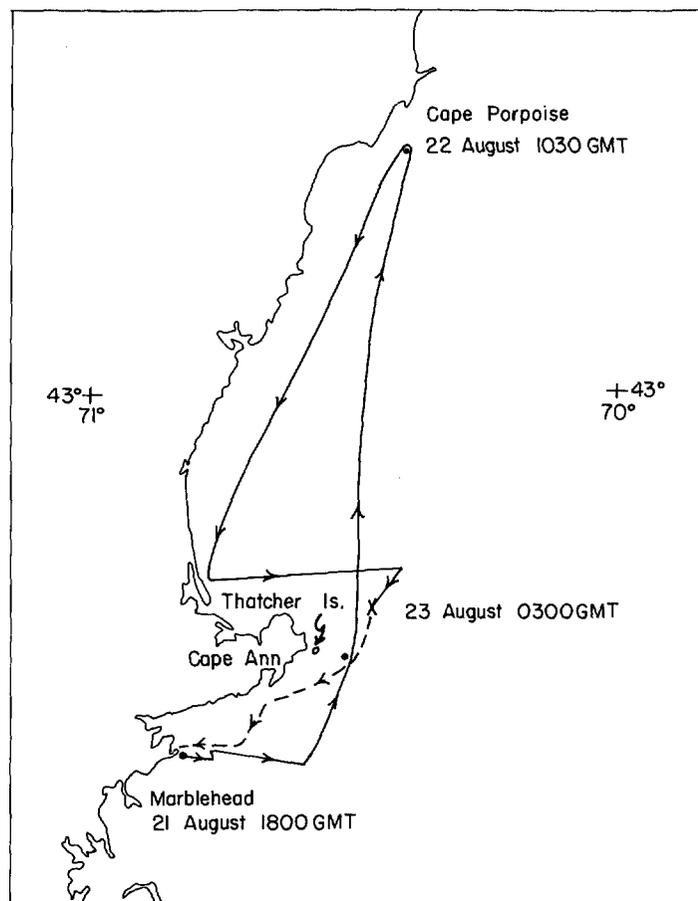


FIGURE 1.—Approximate track of *Holger Danske* during the Chandler Hovey Ocean Race, August 1965.

at Coast Guard Stations, light vessels, merchant marine, and Russian fishing craft (of which a number were operating on Georges Bank). The results are shown in figures 3 a-o. In order to obtain as accurate a pressure analysis as possible the pressures from the hourly stations were averaged for the entire interval. The first-order Weather Bureau stations were assumed to be correct and the others were adjusted to yield a smooth mean pressure field. The corrections were 0.1 mb. for two stations, 0.2 mb. for four, 0.3 mb. for two, 0.4 mb. for two, and 0.5 mb. and 0.6 mb. for one each. Inspection of the 3-hourly maps suggests a residual random variation of 0.1 mb. or 0.2 mb., which is either instrumental, observational, or real but subliminal.

The maps in figure 3 speak for themselves. The relative rises and falls over land and sea due to diurnal heating and cooling can be seen during the early part of the period and are obviously associated with the land-and-sea-breeze regime. Numerous mesofeatures can be seen in the isobaric and isallobaric fields.

The start of the race was a beat to windward around

Thatcher Island in a light east-northeast wind. The wind veered as the mark was rounded, and the run to Cape Porpoise was downwind during the evening in a dying sea breeze under full canvas. At about 0300 GMT (cf. fig. 3e) we were headed by a gentle northwesterly land breeze, which necessitated an agonizing reappraisal of the headsail situation.

By midmorning on the 22d the land breeze had died out, to be replaced by very light and fitful easterlies or southeasterlies throughout most of the day, interspersed with long periods of nearly flat calm. Intermittent rain occurred, but no correlation with wind was noted. This light wind prevailed despite an increasing pressure gradient for southeasterlies. In fact by 1800 GMT (fig. 3j), the geostrophic wind at the approximate position of *Holger Danske* was 180° at 16 kt., yet we were then virtually becalmed off Portsmouth. The Coast Guard Station there observed southeast 2 kt. and the station at Eastern Point, Gloucester, reported east 2 kt.

At about 0000 GMT of the 23d (fig. 3l) the craft was becalmed a few miles northwest of Thatcher Island, where

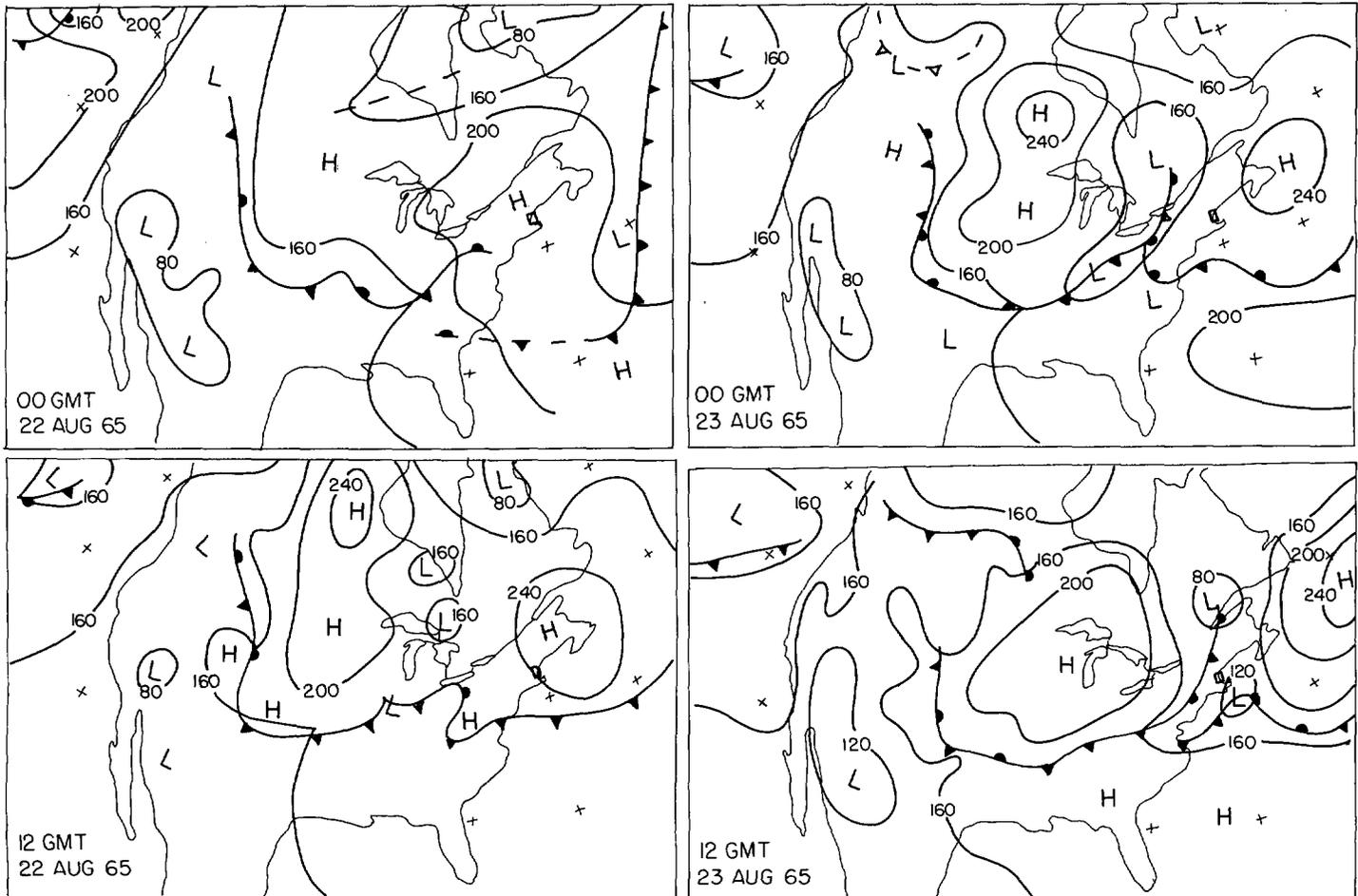


FIGURE 2.—Surface analysis prepared by National Meteorological Center: 0000 GMT August 22, 1965, 1200 GMT August 22, 1965, 0000 GMT August 23, 1965, 1200 GMT August 23, 1965. Area of figure 1 is outlined.

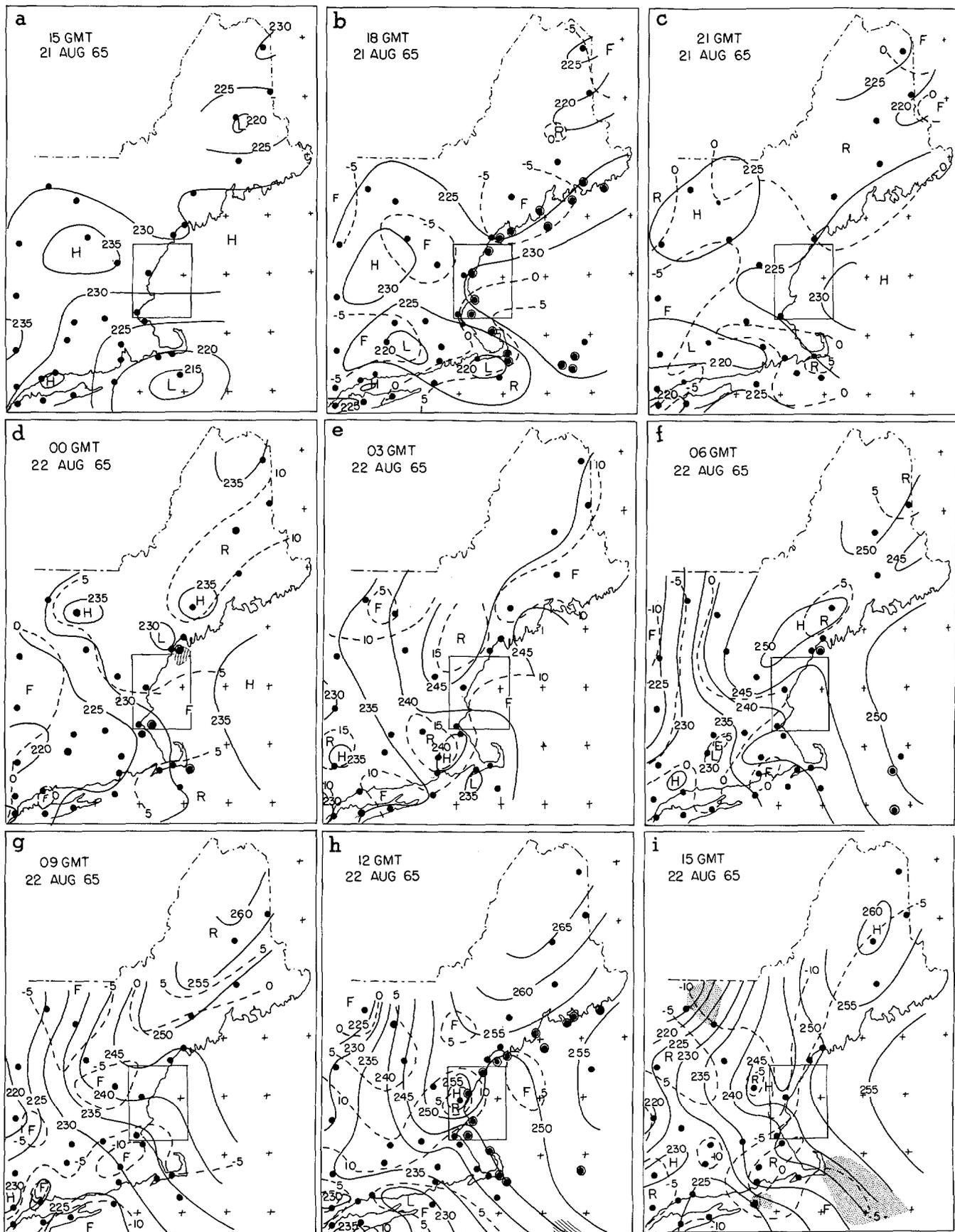


FIGURE 3.—See opposite page for legend.

the geostrophic wind was 130° at 23 kt. Suddenly the stagnant surface layer broke down and within about 2 min. there was an east-southeasterly wind of about 15 kt. Our joy was short lived, however, for within an hour we were fighting increasingly strong winds and mounting seas. The author's estimates of peak wind and significant wave height were 25 kt., with gusts to over 30, and 10 ft. The extremely restricted area of this storm is evident from figures 3 l-n. The peak geostrophic wind measured from the maps was between 35 and 40 kt. From figures 3 l to n it appears that the fetch of this gen-

erating wind could have been as much as 150 n. mi. and the duration (upwind) as long as 8 hr. From data presented by Moskowitz [1] it appears possible that a fully developed sea could have developed, with significant wave heights somewhat in excess of 10 ft. The highest waves reported by any ships used in the analysis were 5 ft., but no such ship was located as was *Holger Danske*, directly downwind from the longest fetch. The seas appeared to be unusually steep and short, perhaps due in part to a tidal current setting southeastward off Thatcher Island.

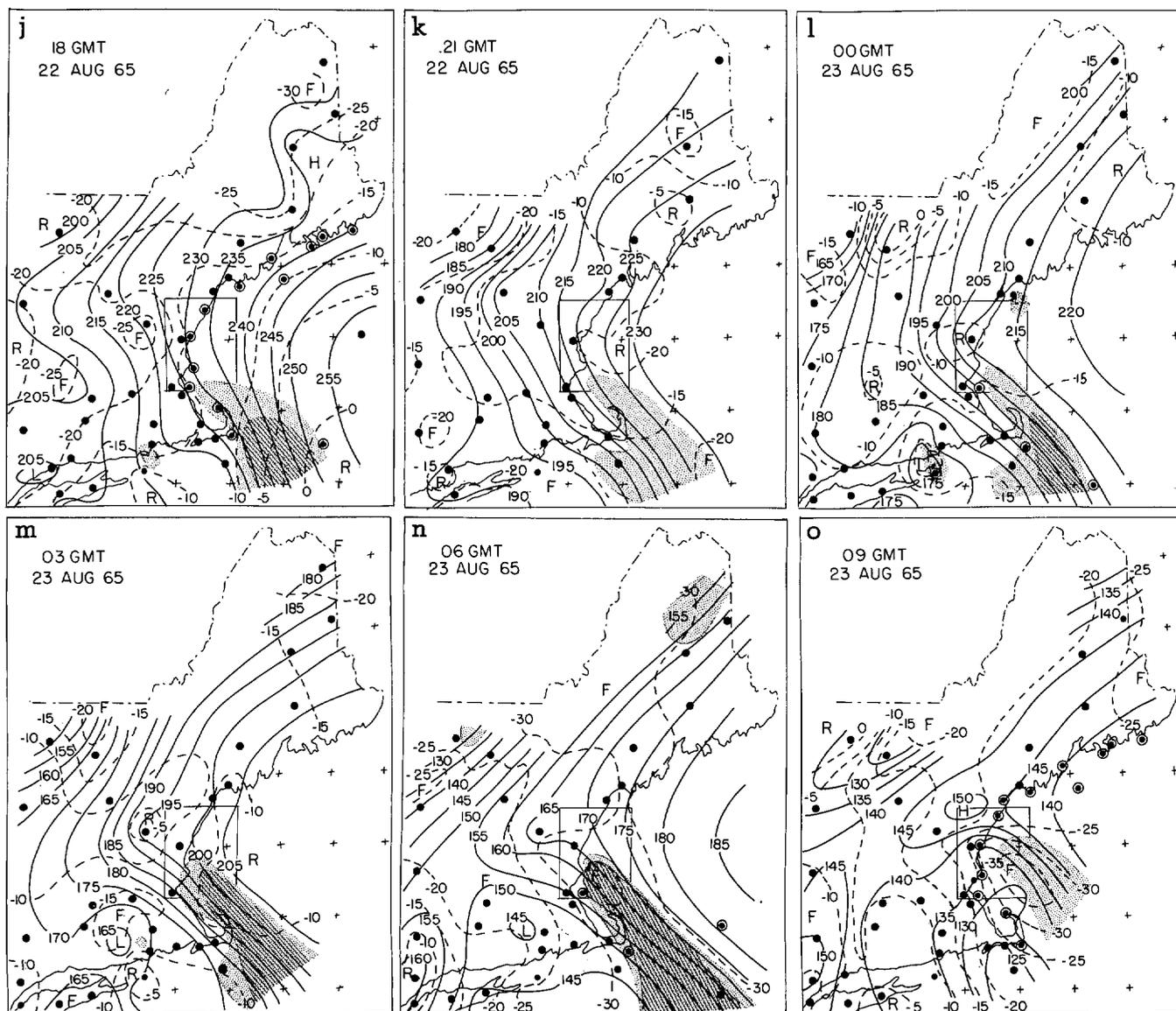


FIGURE 3.—Detailed surface analysis 1500 GMT August 21, 1965 through 0900 GMT August 23, 1965. Solid lines are isobars at intervals of 0.5 mb. Dashed lines are 3-hr. isallobars at intervals of 0.5 mb. per 3 hr. Centers of relative rise and fall are labeled R and F respectively. Hatched area represents wave height 4 ft. or more; stippled area, surface wind 15 kt. or more. Black dots show location of observations used in the analysis. Encircled dots are observations which included information on the state of the sea. Area of figure 1 is outlined.

By the time the mooring in Marblehead was picked up, the crest of the atmospheric wave had passed (fig. 30) and only a faint northeasterly breeze was felt. Hood (personal communication) won by developing an early lead, by finding and holding slightly more wind during the 22d on a course somewhat east of us, and by sailing across the "nose" of the developing southeasterly jet at about 1900 GMT with maximum winds about 14 kt. and no waves higher than 2 ft. As pointed out above, *Robin* went on to cross the finish line at a time when the rest of the yachts which had not already withdrawn were still becalmed north of Cape Ann.

This account is accompanied by a plea. It is conceded that more data over coastal waters is a basic requirement for satisfactory solution of the scientific problems involved. However, it appears that if sufficient manpower were available at the local weather station level,

and if maximum use were made of the already available data, along the lines here illustrated, then more detailed forecasts could be offered and the usefulness of advice to coastal marine interests could be greatly improved.

Thanks go to Mr. Charles Pierce and Mr. Robert Lynde of the U.S. Weather Bureau at Logan Airport, Boston, for helpful discussion and provision of data and to Mr. Frederick E. Hood of Marblehead for an account of his successful strategy and experiences in the race.

REFERENCE

1. L. Moskowitz, "Estimates of the Power Spectrums for Fully Developed Seas for Wind Speeds of 20 to 40 Knots." *Journal of Geophysical Research*, vol. 69, No. 24, Dec. 15, 1964, pp. 5161-5180.

[Received September 30, 1965; revised November 17, 1965]