SEA TEMPERATURE REPORTS
FROM NORTHWEST PACIFIC COAST

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An effort to develop a simple, reliable system for measuring nearshore ocean waves by a land-based seismometer was reported in the Mariners Weather Log in 1974. Since then, the system has been installed and is operational at seven Coast Guard stations along the Pacific Northwest coast (Zopf, Creech, and Quinn, 1976). Wave observations are reported at 3-hr intervals over the Coast Guard teletype network, and a reformatted collection of station reports is forwarded to users over the local NOAA Weather Wire circuit. These reports are one input to coastal weather forecasts made by the National Weather Service (NWS) area forecast centers at Seattle, Wash., and Portland, Oreg.

Figure 20.—Coast Guard teletype weather report format.

The teletype format for Coast Guard weather reports includes a code group for sea surface temperature (fig. 20), but it has not been used in the area because the stations had no measuring equipment. On the other hand, sea temperature information can be useful to the NWS in making forecasts of coastal fog and stratus clouds, and to the Coast Guard for estimating survival time, if the data are available consistently.

Figure 21.—Sea temperature system equipment.

Figure 22.—Pacific Northwest Coast Guard stations with wave and sea temperature systems.

To help remedy this situation, an electronic system was developed (fig. 21) using a thermistor sensor with
Figure 23.—Wave and sea temperature readout meters, Coast Guard station, Coos Bay, Oreg.

A direct meter readout of sea temperature at the communicator's panel in the Coast Guard station. The system has a range of 30° to 70°F and costs about $400 per set, exclusive of installation labor. Tests of the initial unit were conducted at the Yaquina Bay Coast Guard Station in Newport, Oreg., during summer 1976. The sensor was mounted in a brass casing 1 ft from the bottom of the Bay (~20 ft MLLW) at the boathouse. An analog voltage is transmitted to the station over an available telephone pair. It was found that the readings obtained at this location (about 1 mi inside the jetties of the local jetties) were a useful approxima-

mation (± 2°F) to the actual nearshore sea surface temperature, especially near high slack tide, when ocean intrusion into the estuary is maximum.

Based on these results, similar installations have been made at six other Coast Guard stations (fig. 22) which also have wave measurement units (fig. 23). The seven-station network was completed in December 1976. The operating systems are reporting routinely over Coast Guard and NOAA teletype circuits to nearby NWS forecast centers. At Newport, Oreg., and Westport, Wash., the wave and sea temperature meters are also displayed on commercial cable TV channels for use by the public in planning boating operations. Public cable TV displays are planned for other locations in the future.

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REFERENCES


Hints to the Observer

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SEA AND SWELL PERIOD AND DIRECTION

The wave observation is among the most difficult and complex in the International Ship Weather Code. It is also one of the most important elements, since wave forces on ships, structures, and the beach are among the most important engineering considerations that require actual data for planning and design.

In situ wave measurements by instruments have shown that wave-height data from nearby merchant ships are highly reliable. Direction is also reported well, but there is some bias to the compass points. The most significant problems seem to be with period. Wave period is the time interval between the passage of two successive crests of the same wave train past a fixed point.

Reporting of swell direction in tens of degrees (essentially a 36-point code) has been common practice for many years. Orders to the helmsman and entries of ship's course in the log have been expressed in degrees rather than compass points for an even longer period of time. When estimating bearings, however, the use of 8-, 16-, and 32-point systems persists and has resulted in a notable bias in the reporting of swell directions. In figure 24 the 8-point bias is evident. A 16-point bias is present to a lesser but still significa-

otent extent—note that all 16-point frequencies are higher than their adjacent frequencies.

The most common error in wave period appears to be underestimation. A recent comparison of some different wave-period data for an area near Virginia Beach is shown in figure 25. The details of this study are not important here. Of primary significance are the low values of wave period derived from ship observations (including light ships). It is suspected that the low values of period resulted from confusion of wave trains and some degree of miscoding.

Underestimating period is understandable when we consider that many wave trains are generally present at the same time. When timing the passage of a wave train, it is important that the foam, floating object, or other reference be followed from crest to crest of the same wave train. If the period is measured incorrectly from the crest of one wave train to the crest of an intervening wave from another wave train, then the result will be a period that is too short.

Since measurement is complex and coding difficult to remember, the rules and code tables from Weather Service Observing Handbook No. 1 are reproduced here for review.
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