Abstract View

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Design of an Oceanographic Network in the Midlatitude North Pacific

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ABSTRACT

Reported here are the statistical results leading to the design of an optimum oceanographic network in the interior midlatitude North Pacific from 30 to 50° N, the primary function of which is to detect the generation and evolution of large-scale temperature anomalies in both the surface and subsurface layers of the upper 50 m of ocean. The method used in this optimum network design is based on linear least-squares estimation developed by Gandin (1963), wherein it is necessary to determine the first and second statistical moments (i.e., mean and covariance distribution, respectively) of the variable field, leading to the estimation of the dominant space and time scales of variability, as well as the signal-to-noise ratio. Having determined this information on the statistical structure of the thermal field in the interior midlatitude North Pacific (i.e., L_x = 1500 km, L_y = 1000 km, T = 10 months, S/N = 0.5), the minimum sampling density (i.e., 1 station per 200 km square per month) and maximum instrument error (a lσ accuracy of 0.2°C) are defined, necessary to detect the large-scale thermal variability. This latter information is then used in the actual construction of an oceanographic network, where since January 1976 XBT systems (having a lσ accuracy of 0.07°C) have been placed aboard 22 ships of opportunity that ply the trade routes between the west coast of North America and Japan. Examples of temperature anomaly maps, constructed monthly from 300 XBT's taken randomly over the region 30–50°N, 140–150°E, are presented. As a check on map reliability, the surface and subsurface temperature maps produced by this XBT network are compared with surface maps constructed by ship-injection temperature and subsurface maps constructed from research vessel XBT data.

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