Abstract View

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On the Nature and Causes of Large-Scale Thermal Variability in the Central North Pacific Ocean

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ABSTRACT

Long-range Naval aircraft using AXBT's obtained meridional temperature sections from the central Pacific Ocean along 158 and 170°W between 30 and 50°N at approximately monthly intervals between November 1974 and April 1977 (29 months). Analyses of these sections show that the seasonal cycle in the central ocean is confined largely to the upper 100 m. The phase of the seasonal cycle increases with depth so that at 100 m it lags the surface by three months. Exceptions to the above statements occur in two narrow bands centered on latitudes 42 and 36°N where the seasonal cycle apparently penetrates in phase to the limit of observations (300 m) except in the interval 100–150 m which lags the surface by 1–2 months. Approximately 90–95% of the variance in the seasonal change of heat storage in the study region can be accounted for by air/sea heat exchange and some type of vertical mixing. Horizontal and vertical advection were of limited and little use, respectively, in reproducing the seasonal cycle variance.

The spatially coherent features of the non-seasonal, or anomaly, field were confined largely to the upper 100 m, with small spatial scales dominating the variance field below 100 m. This implies that the often studied sea surface temperature anomalies are associated with a thermal structure largely confined to the mixed layer. It was not possible to explain quantitatively a significant portion of the variance of the heat storage anomalies in terms of currently available estimates of air/sea heat exchange and advective processes. This result is partially due to noise introduced into the heat budget calculations by sampling variability. However, the major reason for the result appears to be poor estimates of the heat budget source terms. Estimates of these source terms must be substantially improved if quantitative understanding of interannual ocean variability is to be achieved.

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