Abstract View

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The Thermocline Response to Transient Atmospheric Forcing in the Interior Midlatitude North Pacific 1976–1978

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ABSTRACT

The Ekman pumping mechanism for altering the depth of the main thermocline in response to wind stress curl is tested in the central midlatitude North Pacific. According to this mechanism, the depth of the main thermocline should decrease under cyclonic wind stress curl and increase under anticyclonic wind stress curl. For the two years 1976–78, temperature measurements from an XBT measurement program between North America and Japan have allowed the monthly thermal structure to be measured over an area 30–50°N, 130–170°W, accompanied with synoptic estimates of wind stress curl. Working with anomalous estimates that deviate from the normal seasonal cycle, the month-to-month secular change in the depth of the main thermocline during the nine months of each year from February to October is found to have responded to the anomalous wind stress curl according to what was expected from the Ekman pumping mechanism. The expected and observed secular changes in the thermocline depth for these times of the year were correlated with each other at the 1% significance level in the latitudinal band from 35–45°N (except in the near field of the Subarctic Front) along 160°W. However, during the other part of each year (November, December and January), when synoptic storm forcing was at its peak, the depth of the main thermocline did not respond to the wind stress curl in the manner expected. Rather, the depth of the main thermocline tended to respond in the opposite fashion. This suggests that other mechanisms associated with autumn/winter forcing may have been important.

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