Abstract View

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Interannual Westward-Propagating Baroclinic Long-Wave Activity on Line P in the Eastern Midlatitude North Pacific

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ABSTRACT

For the period 1959–81, quasi-zonal hydrographic sections have been made between the southern coast of Vancouver Island (49°N, 126°W) and Ocean Station P (50°N, 145°W) approximately every two months. Along this section (called Line P) hydrographic-STD stations were repeated at nearly the same locations, approximately 2° of longitude apart and at closer intervals near the coast. As such, 13 stations in all were made nearly every two months over the 23-year period. Thus, the Line P dataset has particular value in verifying the existence of interannual baroclinic long waves near 50°N. In previous studies, White, Kang and Magaard, and White and Saur, had found evidence of annual and interannual baroclinic long-wave activity in the eastern midlatitude North Pacific over the range 20°–40°N, but earlier attempts could not discover these westward-traveling waves along Line P. In this study, both spectral analysis and complex empirical orthogonal function analysis are used to do just that. Concentrating upon the depth of the σ_t = 26.8 density surface, which lay just below the main halocline but within the main pycnocline, the time-longitude matrix of interannual anomalies about the long-term mean annual cycle display westward propagation of much longer period (2–5 years), with speeds similar to baroclinic Rossby waves, over the entire length of the section. The zonal wavenumber/frequency spectrum of this dataset finds the maximum spectral energy density overlying the linear Rossby wave dispersion curve. The first two complex EOFs both show westward propagation, one with larger period/wavelength than the other, both together explaining 46% of the total variance of the 23-year record. Recombining the time-longitude matrix from only these first two complex EOFs shows that the interannual baroclinic long waves tend to be associated with ENSO events that have now been found to occur in both the ocean and the atmosphere throughout the Pacific basin every 2–5 years.

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