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[Volume 16, Issue 8 \(August 1986\)](#)

Journal of Physical Oceanography

Article: pp. 1378–1398 | [Abstract](#) | [PDF \(1.63M\)](#)

Annual and Interannual Variability of Steric Sea Level along Line P in the Northeast Pacific Ocean

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(Manuscript received January 25, 1985, in final form January 8, 1986)

DOI: 10.1175/1520-0485(1986)016<1378:AAIVOS>2.0.CO;2

ABSTRACT

Twenty-five and 22 years of hydrographic-STD casts from Station P and Line P, respectively, have been utilized to describe the annual and interannual variability of thermosteric, halosteric and total steric heights. In the offshore region beyond the continental slope thermosteric effect dominates the annual cycle of total steric height, whereas near the coast over the continental shelf halosteric effect controls the height. In between, over the slope, both temperature and salinity effect contribute almost equally to the annual cycle of height. Offshore, the annual change of steric height relative to 1000 db resembles that relative to 100 db, but as the coast is approached, the change due to the deeper water becomes more important. The heat budget within the upper 100 db of water determines most of the annual range of steric height offshore, but near the coast both dilution due to precipitation and runoff in winter and concentration due to upwelling of cool, saline water in summer govern the annual cycle of height. The annual variation of coastal, baroclinic currents appears to account for the observed annual range of adjusted mean sea level along the coast. Local currents seem to be the main factor affecting coastal sea level and not the general, large-scale oceanic circulation offshore. Considerable interannual variability of steric height is present everywhere along the Line, but it is difficult to determine any well-defined periodicity in the time-series data. “Spectral” maxima at approximately 6, 4, 3 and 2 years in addition to the strong annual period are present at various locations along the Line but only the six-year cycle at Station P can be considered reliable. Due to the limited amount of data along the Line, it is difficult to assign significance to these results. In the open ocean the interannual variability appears to be related to the time-integrated divergence of the Ekman transport.

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