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Spectra of North Pacific Temperature and Salinity Perturbations in the Depth Domain

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ABSTRACT

In the central North Pacific, temperature and salinity depth profiles show considerable fine structure, the features of which are most pronounced in the thermocline and halocline, as well as near water mass boundaries. By partitioning the observed series into mean and perturbation values, it is possible to obtain some statistical measures for the perturbations. Wavenumber spectra of temperature, salinity, sound velocity and density were computed for the wavenumber range between 0 and 167 cycles per kilometer. The perturbation spectra for the different geographical regions of the transition zone are essentially the same, for a given variable. In all cases the power density of the perturbations decreases with increasing wavenumber. The power law decay coefficient at low wavenumbers is about $-8/3$. It decreases gradually with increasing wavenumber. Superimposed upon the smooth decrease in power density are random fluctuations, most of them insignificant at the 95% confidence level. The perturbations are generally incoherent over distances of the order of 50 km. For a given station, temperature and salinity perturbations are coherent at low wavenumbers, but incoherent at high wavenumbers.

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