Abstract View

Volume 17, Issue 12 (December 1987)

Journal of Physical Oceanography
Article: pp. 2168–2188 | Abstract | PDF (2.23M)

Estimates of Time and Space Scales at 300 Meters in the Midlatitude North Pacific from the TRANSPAC XBT Program

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(Manuscript received December 30, 1986, in final form June 5, 1987)

DOI: 10.1175/1520-0485(1987)017<2168:EOTASS>2.0.CO;2

ABSTRACT

Estimates of length and time scales of temperature variability at 300 meters in the midlatitude North Pacific are made. Data are XBT traces collected from 1976 to 1984 in the TRANSPAC Volunteer Observing Ship program. Temperatures at 300 meters are grouped in two-mouth bins and gridded using the Surface II mapping program.

Temperature variance about the time mean is largest in the Kuroshio Extension and nearly constant in the eastern North Pacific. A cooling trend occurred in the eastern North Pacific over the eight years of the dataset. In the western Pacific, the annual cycle is most intense 1°–2° north of the Kuroshio Extension, with an indication of meridional propagation away from the region of most intense variability. Propagation of annual waves in the eastern Pacific was predominantly northwestward.

Wavenumber and frequency spectra are computed from normalized temperatures with the mean and bimonthly average removed in order to eliminate the dominant annual cycle. Based on the overall temperature variance, the North Pacific was divided into western and eastern regions. Zonal wavenumber and frequency spectra and two-dimensional ω/k spectra were computed for a number of latitudes in the eastern and western regions. Two-dimensional k/l spectra were also computed for the western and eastern regions. The spectra indicate westward propagation throughout the midlatitude North Pacific with additional eastward propagation in the Kuroshio Extension region, shorter length and time scales in the Kuroshio Extension compared with other regions, and slight dominance of southwestward propagation in bath the eastern and western North Pacific.

Tests to determine the effective spatial resolution of the dataset indicate that local average-station spacing is a good measure of local Nyquist wavelength. However, because of the nearly random sampling in a spatially limited region, an unresolved wave is aliased more or less in a band stretching towards low wavenumber rather than folded in coherent, predictable locations in the spectrum. With the choice of a two-month time bin, spectra are about equally aliased in space and time, with Nyquist wavelength and period close to the beginning of energy rolloff reported in other surveys, which have better spatial resolution but less degrees of freedom.

top

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