Abstract View

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Aspects of the Tidal Variability Observed on the Southern California Continental Shelf

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ABSTRACT

Observations of the current and temperature field from the southern California continental shelf are analyzed in a frequency band (0.6–6 cpd) dominated by tidal fluctuations. The seasonal variability of the temperature and horizontal velocity component fields for this frequency band is characterized both in terms of mean variance statistics and change in the power spectra. The most striking seasonally varying feature is the O(10^2) increase in tidal band temperature variance observed from winter to summer on the inner shelf. Energetic cuspate peaks are observed centered at 1, 2, 3 and 4 cpd. The bandwidth of the peaks is approximately 0.2 cpd giving a decorrelation time of 5 days for tidally-induced current and velocity component fluctuations. A complex empirical eigenfunction analysis indicates that the amplitude and phase of coherent structures in the velocity component and temperature fields vary over vertical and horizontal spatial scales comparable to the local depth and shelf width respectively. The most energetic modes vary in spatial structure with frequency. The first mode semidiurnal (diurnal) fluctuations tend to be bottom (surface) intensified. The estimated vertically averaged cross-shelf mass transport associated with semidiurnal and diurnal cross-shelf currents is sufficient to sustain tidal sea surface elevation changes. The total cross-shelf mass exchange is approximately three times larger than the vertically averaged mass flux at tidal frequencies. Estimates of the bulk Richardson number indicate the vertical current shears associated with baroclinic fluctuations in the tidal frequency band are of sufficient magnitude to induce a marginally stable baroclinic flow field on the shelf.

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