Abstract View

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Temperature and Currents on the Southern California Shelf: A Description of the Variability

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ABSTRACT

Temperature and horizontal current observations at three water depths (15, 30 and 60 m) over the Southern California shelf are reported for four discrete periods during 1978–79, roughly corresponding to each of the principal seasons. The vertical structure of temperature changes markedly during the year; the water over the shelf is weakly stratified in the winter (N = 50 cpd) but stratification is stronger in the summer (N = 250 cpd). Seasonal changes in vertically averaged temperature are comparatively unimportant. Long-term averages of the longshore currents are to the south near the surface in all seasons, with amplitudes ranging up to 10 cm s^{-1} in the winter. During spring and summer, the stratification is accompanied by shear in the vertical structure of these long-term current averages, with surface currents sweeping to the south, but with deeper, colder water flowing in the opposite direction. Currents fluctuating at subtidal frequencies are predominantly alongshore and are strongest during the winter. The major fluctuations in this frequency band may he decomposed into barotropic and baroclinic components; the latter reach their maximum amplitudes during the summer. Relations between the barotropic currents, longshore wind stress, and synthetic bottom pressure are remarkably similar to those defined previously off Oregon, although the amplitude of currents is observed to increase with distance offshore. At tidal frequencies, both cross-shelf and longshore modes of fluctuation are important. Neither is well correlated to tidal sea surface elevation over long periods. The principal mode of variability associated with longshore tidal currents is barotropic, while that associated with cross-shelf currents is baroclinic. The motion in the cross-shelf plane resembles that due to a standing gravest-mode internal wave. At supratidal frequencies, internal waves travel onshore during those seasons when the water column is strongly stratified. The propagation characteristics of these high-frequency currents are similar to those expected for shoaling interfacial waves.

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