Abstract View

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The Three-Dimensional Circulation near the Eastern North pacific Subtropical Front

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ABSTRACT

The purpose of our study is to describe and compute the large-scale, three-dimensional circulation near the Subtropical Front in the eastern North Pacific along 31°N. This was accomplished through the use of four extensive hydrographic surveys, historical wind-stress data and also the movement of surface drifters. Our results indicate that, in wintertime, surface water sinks on the north side of the front and rises on its south side. During the summer, however, the subtropical salty surface water overflows the frontal area to the north. Potential vorticity and heat are best conserved in a vertical flow pattern where the annual mean Ekman convergence sinks to a depth of 300 m and water upwells throughout the main thermocline. The computed horizontal flow below 700 m amounts to less than 0.6 cm s^{-1}; both strength and direction depend greatly on the treatment of noise within the data set and also on the conservation statement that is specified in addition to geostrophic and hydrostatic dynamics. A qualitatively consistent circulation pattern, with a horizontal and vertical spread of freshwater tongues, has been found above 500 m. However, as Coats noted in 1981, diffusion rates cannot be adequately determined because of the difficulty involved in establishing 1arge-scale property changes when eddy noise is present. Below 700 m potential vorticity is uniform, while water-mass properties exhibit gradients. The eddy kinetic energy, as determined from surface drifters, increases threefold from 40°N to 20°N.