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Mesoscale Thermohaline, Sound Velocity and Baroclinic Flow Structure of the Pacific Subtropical Front During the Winter of 1980

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ABSTRACT

The three-dimensional thermohaline, sound velocity and baroclinic flow structure of the Pacific sub-tropical front during January and February 1980 are discussed. The front is meander-like, with a wavelength of 180 km, a wave amplitude of 55 km, and is centered around latitude 30°N. On 37 km spatial and 10-day time scales the front barely moves, but its intensity increases due to an intrusion of cold and low-salinity water from the north. The front is nearly vertical in the upper 130 m and slopes southward below. The strongest cross-frontal differences are 1.7°C for temperature, 0.6‰ for salinity, 0.4 kg m⁻³ for density and 13 m s⁻¹ for sound velocity and occur beneath the base of the mixed layer. The baroclinic flow field indicates a meandering current with maximum speeds of 0.3 m s⁻¹. Cyclonic eddies occur north and anti-cyclonic eddies occur south of the front. Satellite-tracked drifters confirm these patterns. Vertical shear of the baroclinic flow in the frontal region varies between 10⁻⁴ and 10⁻³ s⁻¹ and is strongest below the base of the mixed layer. The principle of conservation of potential vorticity is applied to fronts and compared to observations.

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