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Observations of Frontal Instabilities on an Upwelling Filament

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ABSTRACT

Frontal instabilities were observed along a density front on the cyclonic boundary of an upwelling filament that formed north of Pt. Arguello, California in October 1983. Observations of the instabilities were conducted using satellite sea surface temperature images and in situ sampling. The instabilities formed on the southern (cyclonic) boundary of the filament at a wavelength of about 20 km and consisted of two lobes, one warm and one cool, each with a width of about 4 km. The time scale for formation of the instabilities is about 1 day. Near-surface distributions of temperature, salinity, and density within the cool lobes of the instabilities are consistent with local upwelling at the rate of about 30 m d^{-1} . A simple model based on conservation of potential vorticity is presented, which accounts for the observed upwelling. Based on isopycnal displacements and the distribution of salinity, the signature of the instabilities appears to be confined to the upper 50 m of the water column.

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