Abstract View

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The Offshore Structure and Subsurface Expression of Sea Level Variations off Peru, 1976–1977

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ABSTRACT

Between April 1976 and May 1977, more than 35 repeated hydrographic sections were made just south of Cabo Nazca, Peru at 15°S, and sea level was measured continuously by a tide gage at San Juan. The sea level data were filtered to remove diurnal and shorter variations, and adjusted for the inverted barometer effect. For each hydrographic section, the dynamic height of the sea surface was computed relative to 500 and 600 db. Changes in the dynamic height at the station nearest the coast agree well with changes in the coastal sea level. The dynamic height data are therefore a good representation of the height of the sea surface along the section, and are used to examine the offshore structure of sea level fluctuations. The amplitude of these fluctuations decreases rapidly with distance from shore, with an offshore length scale of 30–60 km. The variations in sea level are associated with changes in the depth of subthermocline isotherms at depths of ~ 300–500 m, rather than with a change in the depth of the thermocline which remains between 50 and 100 m. The variations in sea level are also associated with fluctuations in the alongshore geostrophic velocity. Near the continental slope the amplitude of the geostrophic velocity fluctuations is constant down to ~ 300 m and then decreases rapidly down to ~ 500 m. These characteristics are consistent with the idea that the sea level variations are a manifestation of a poleward propagating internal Kelvin wave, with the interface at ~ 400 m rather than at the thermocline. Mean geostrophic velocity profiles show a poleward undercurrent with maximum southeastward flow of about 15 cm s^{-1} at a depth of 100 m near the continental slope (35 km from shore); the mean undercurrent is barely discernible 60 km from shore, and not observed 100 km from shore.

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