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Intraseasonal Oscillations in Sea Level along the West Coast of the Americas

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ABSTRACT

Hourly observations of coastal sea level at stations from Peru to British Columbia are analyzed for low-frequency content. A space-time contour plot of sea level, from four years of data during the 1971–75 period, shows the meridional structure of the seasonal cycle and interannual variability associated with the 1972–73 El Niño. Oscillations with intraseasonal periods of 36–73 days are also evident, coherent over alongshore distances of several thousand kilometers. Further investigation using spectral methods and empirical orthogonal function analysis in the frequency domain reveals, in particular, that intraseasonal sea level variability has a peak in spectral density along the coasts of South America, Central America and Mexico, with high coherence from near the equator (Tumaco, 2°N) north to central California (34°N) and south to at least Callao (12°S). Phase propagation north of the equator is poleward at 150–200 kilometers/day. Atmospheric pressure, alongshore wind stress and wind stress curl, derived from Fleet Numerical Oceanography Center data for the Northern Hemisphere, are used to assess the importance of local atmospheric forcing. The low coherence between sea level and these fields in the intraseasonal frequency band suggests that the observed oscillation may be a coastally propagating response to remote processes in the equatorial Pacific waveguide.

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