Abstract View

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Large-Scale Sea Level Response to Atmospheric Forcing along the West Coast of North America, Summer 1973

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ABSTRACT

Along the west Coast of North America, the response of sea level to fluctuations in alongshore wind stress at large alongshore scales (> 1000 km) accounted for a substantial faction of the total sea level variance during summer 1973. Space-time contour plots of sea level and alongshore stress show that the response of sea level to poleward propagating wind stress events was generally stronger than the response to equatorward propagating events. Atmospheric forcing was most effective in two regions along the coast, with relatively strong forcing and response along northern California and Oregon, and somewhat weaker forcing and response along northern Baja California. The forced fluctuations in sea level propagated poleward away from these forcing regions, causing local sea level to be most correlated with alongshore wind stress earlier in time and at a distant equatorward 1ocation. Along the southern and central California coast, fluctuation in sea level were partly forced along northern Baja California, although some of the energy may have entered the domain from the south. Poleward of Crescent City, fluctuations in sea level were dominated by the response to alongshore stress in the northern forcing region, and were therefore poorly correlated with sea level to the south. Most of the sea level energy was contained in two frequency domain modes representing the northern and southern fluctuations in sea level. The southern mode had proportionally more energy than the northern mode at a frequency of 0.043 cpd, while the opposite was true for frequencies between 0.086 and 0.22 cpd. Sea level apparently responded more effectively in frequency bands where fluctuations in wind stress propagated poleward and acted over a longer alongshore distance. Along the British Columbia coast, local atmospheric forcing was relatively ineffective, and fluctuations in sea level were apparently dominated by free wave energy propagating poleward from the northern forcing region. Predictions of sea level response made from simple theory of wind-forced coastal-trapped waves were similar to the observed response, and accounted for up to 70% of the total variance along Oregon and Washington, poleward of the northern forcing region.

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