Abstract View

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The Generation and Propagation of Sea Level Variability Along the Pacific Coast of Mexico

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ABSTRACT

Case history analysis, cross spectra and multiple regression analysis have been used in a study of low-pass filtered sea level records from the Pacific mainland coast of Mexico in 1971 and 1973–75. During the summer-fall season (May–October), sea level variability is characterized by strong alongshore coherence and nondispersive, poleward phase propagation over a wide frequency range (0.02–0.37 cpd). The strength and clarity of the propagating signals seem to be related primarily to large-amplitude events of elevation (10–30 cm) that are generated off the southern coast of Mexico by tropical storms. These events are typically forced by the alongshore, poleward movements of the storms to as far north as 20°N, and thereafter continue to propagate freely at least as far as Guyamas (28°N). Large, variable phase speeds (250–500 km day^{-1} are observed in the southern region, consistent with the alongshore speeds of the forcing. A multiple-input statistical forcing model, in which adjusted sea level is regressed on local wind, large-scale atmospheric pressure and remotes sea level and wind, confirms that the disturbances are forced in the south and propagate freely in the north. North of 20°N, propagation speeds are similar than in the south and relatively invariant at each station, and show a steady decrease from 250–300 km day^{-1} near Mazatlan (23°N) to 180–230 km day^{-1} near Guaymas (28°N). These characteristics of the northern propagation are consistent with those from the theory of free, linear, hybrid coastal trapped waves, as computed from an inviscid numerical model by Brink (1982). The observed speeds in the south, however, are much faster than predicted by theory, consistent with their forced nature. The model results show a strongly barotropic velocity structure over the continental shelf, and a baroclinic structure farther offshore. In winter (November–April), the alongshore coherence of sea level is less than in summer at all stations, and only appreciable between Acapulco (17°N) and Mazatlan (23°N). The winter phase propagation (140–230 km day^{-1}) is generally slower than in summer, most notably in the south, where it is consistent with a lack of forcing.

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