



The influence of offshore waters on connected harbors

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An important question regarding the terminal effects of tsunamis relates to the excitation of a harbor or bay by a tsunami generated by a distant seismic source. In general it is not the harbor alone which is excited by the transient wave system, but the total complex of offshore waters and the connected harbor are important. This was demonstrated originally by Wilson (1971) and Raichlen (1972), but in some studies the idea still persists that the harbor (or bay) complex alone defines the shoreward effect of these events. It can be shown for the 1960 Chilean and the 1964 Alaskan tsunamis that the coastal water off southern California from Santa Monica Bay to San Diego, a distance of about 200 km, is involved in the local oscillations observed in bays and harbors. The normalized spectra obtained from marigrams of these two events at three locations: Santa Monica Bay, the Port of Los Angeles, and La Jolla (north of San Diego) are similar. They show major concentrations of energy at periods of 38 min and about 2 hrs. In addition, the normalized spectra at Ensenada, Mexico (Baja California) for these two events are similar, but show different energy-frequency content compared to the measurements in southern California. Additional support for the concept of offshore oscillations induced by the leading tsunami waves being the source of motions in harbors is provided by the frequency distributions of normalized wave heights at various locations in the Ports of Los Angeles and Long Beach, California due to four tsunamis for the period from 1922 to 1964; during this interval the configuration of the Ports changed significantly. In addition to discussions of the above, some consideration will be given to the question of the general nature of harbor response to transient waves.

References

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