Geophysical Research Abstracts
Vol. 12, EGU2010-14345, 2010
EGU General Assembly 2010

Methodology for Estimating Tsunami Induced Hazard for Ports Along California Coastline

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Los Angeles County hosts two of the busiest container ports in the United States. The ports are adjacent to one another in San Pedro Bay but are operated separately by the cities of Long Beach and Los Angeles. Due to their importance to United States commerce, the hazard posed by tsunami is of great concern as the potential devastation and impact would likely interrupt commerce and marine activities. Furthermore, a tsunami would be hazardous to both the resident coastal population and the tourist trade for which these cities rely on for income. The Maritime Museum, Aquarium of the Pacific, and Queen Mary would all potentially be impacted by a tsunami. The seismic history of the Southern California Bight is well documented and confirms the tsunami generating potential of the region. A comprehensive study of the threat from near-field generation was conducted by Borrero et al. (2001, 2004). Dykstra and Jin (2006) and Moffatt and Nichol (2007) expanded these near-field studies by inclusion of tsunamis generated in the far-field along the Cascadia Subduction Zone. Prior to the Kuril Islands event in November 2006, most studies focused on wave heights as the dominant measure of hazard. However, the impact of Kuril Islands tsunami at Crescent City, CA demonstrated that distant sources have the potential of inducing strong currents in harbors. To investigate the hazard posed by currents, a sensitivity study is performed for 322 tsunami sources for Mw 9.3 earthquakes along Pacific Rim subduction zones using the Method of Splitting Tsunamis model (Titov and Synolakis, 1998). Of the scenarios investigated, eleven sources in Alaska, Chile, Philippines, Manu, New Zealand and Vanuatu are identified as potentially hazardous to Ports in Southern California. Initial study results suggest that a Mw 9.3 earthquake can potentially trigger a tsunami with wave amplitudes reaching up to 2 m and currents exceeding 8 knots in Los Angeles Harbor. This study also suggests that Pacific Basin subduction zones in addition to those in Alaska and along the Aleutians are capable of generating tsunamis that pose a threat to Southern California harbors.

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