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Tsunamigenic Rate of the Pacific Ocean Earthquakes

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Pacific Ocean is the location where three-fourth of the total number of tsunami had occurred. Countries surrounding this Pacific basin suffered from many tsunamis and killed great number of life. Problem occurs when earthquake information has issued, for example, what is a potential of a tsunami generation for such an earthquake magnitude or focal depth is known? This study proposed Tsunamigenic Rate (TR) which is defined as the ratio between the number of earthquake-generated tsunamis and the total number of earthquake occurred.

This study considers the NGDC database which contains earthquake event of 200 B.C. to present (from year -193 to 2010). The earthquake event excludes an event that the epicenter located longer 50 km from a shoreline. Total number of tsunami associated event is 743 and tsunami was not associated event is 735 leads to the total number of 1,478 events. Consequently, the Tsunamigenic Rate (TR) is calculated from earthquake event of the magnitude varies from 5.0 to 9.0, focal depth is as deep as 200 km and sea depth is as deep as 7,000 m. The Pacific Ocean is geographically divided into 9 regions namely, New Zealand-Tonga (NZE), New Guinea-Solomon (NGS), Indonesia (IND), Philippines (PHI), Japan (JAP), Kuril-Kamchatka (K&K), Alaska-Aleutians (A&A), Central America (CAM) and South America (SAM).

Results support that greater earthquake magnitude and shallow focal depth has high potential to generate tsunami with high tsunami height. The average TR in Pacific Ocean is 0.50 where TR for each region varies from 0.35 (CAM) to 0.68 (NGS). TR for each region was calculated and shows the relationship with the three influence parameters namely, earthquake magnitude, focal depth and sea depth. The Tsunamigenic Rate will help ascertain one decision for a tsunami generation of each earthquake event based on a statistical basis of the historical data and decision support tool during an early tsunami warning stage.

Keywords: Earthquake, Tsunami, Pacific Ocean