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IJG > Vol.2 No.3, August 2011

OPEN ACCESS

Critical Factors for Run-up and Impact of the Tohoku Earthquake Tsunami

PDF (Size: 1364KB) PP. 310-317 DOI: 10.4236/ijg.2011.23033

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ABSTRACT

The earthquake of March 11 of magnitude 9 offshore Tohoku, Japan, was followed by a tsunami wave with particularly destructive impact, over a coastal area extending approx. 850km along the Pacific Coast of Honshu Island. First arrival times and measurements and maximum height were recorded by the Japanese monitoring system (wherever there was no failure of the equipment). The maximum run-up is well evident in satellite images available through USGS, Google and other institutes. Moreover, personal observations of Prof. Lekkas were made during a field survey in March 2011. The results of the study of the tsunami impact and run-up show the variety of factors affecting the run-up, creating zones with similar phenomena, but also specific locations where run-up exceeds by far the run-up zone maximum values. This differentiation, observed also in the past by other authors, is here attributed to the general orientation of the coast, the distance from the tsunami generation area, bathymetry offshore, the coastline morphology and land geomorphology. In certain cases that funnelling and reflection effects in narrow gulfs parallel to the tsunami propagation vector were combined with narrow valleys onshore, peak run-up exceeded 20m, or even 40 m (Miyagi coastline, Ogatsu, Onagawa, etc).

KEYWORDS

Tohoku, Earthquake, Tsunami, Run-Up

Cite this paper

E. Lekkas, E. Andreadakis, I. Kostaki and E. Kapourani, "Critical Factors for Run-up and Impact of the Tohoku Earthquake Tsunami," *International Journal of Geosciences*, Vol. 2 No. 3, 2011, pp. 310-317. doi: 10.4236/ijg.2011.23033.

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