Oral Session Abstracts

Numerical Modeling of the Global Tsunami: Indonesian Tsunami of 26 December 2004

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Numerical model for the long waves, with spatial resolution of one minute, is applied to the tsunami of 26 December 2004 in the World Ocean from 80 S to 69 N. Because the computational domain includes close to 200 million grid points, a parallel version of the code was developed and run on a supercomputer. The high spatial resolution of one minute produces very small numerical dispersion even when tsunamis wave travel over large distances. Model results for the Indonesian tsunami show that the tsunami traveled to every location of the World Ocean. In the Indian Ocean the tsunami properties are related to the source function, i.e., to the magnitude of the bottom displacement and directional properties of the source. In the Southern Ocean surrounding Antarctica, in the Pacific, and especially in the Atlantic, tsunami waves propagate over large distances by energy ducting over oceanic ridges. Tsunami energy is concentrated by long wave trapping over the oceanic ridges. Our computations show the Coriolis force plays a noticeable but secondary role in the trapping. Travel times obtained from computations as arrival of the first significant wave show a clear and consistent pattern only in the region of the high amplitude and in the simply connected domains. The tsunami traveled from Indonesia, around New Zealand, and into the Pacific Ocean. The path through the deep ocean to North America carried miniscule energy, while the stronger signal traveled a much longer distance via South Pacific ridges. The time difference between first signal and later signals strong enough to be recorded at North Pacific locations was several hours.