Geophysical Research Abstracts, Vol. 7, 06399, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06399

Tsunamis excited by near-shore seismic sources: an analytical study

S. Tinti and R. Tonini

Dipartimento di Fisica, Settore di Geofisica, Università di Bologna, Italy

The most frequent sources of tsunamis are strong submarine earthquakes that deform the sea floor. When the seismic source is located near the shore it can produce a non-negligible permanently deformation of the coast itself. The seafloor co-seismic displacement produced by the seismic event is usually assumed to be equal to the initial sea surface tsunami elevation. A widely used tool to quantify the co-seismic deformation is represented by the set of analytical formulas deduced by Okada (1985, 1992), valid for a rectangular fault source buried in a perfectly elastic half-space. Here we consider the classical work by Carrier and Greenspan - C&G - (1958), that allows one to reduce the non linear shallow water equations to a linear problem, by introducing an idealised constant-slope sea bed. We introduce a new analytical solution by generalising one example given in the C&G paper. Our solution allows us to account for initial conditions associated with paradigmatic cases of sea bottom deformations produced by near-shore earthquakes, such as subsidence, uplift or more complex deformations of the coast. We find that the tsunami height amplifications at the coast range approximately from 1 to 2, which is considerably less than the known amplification of tsunamis from remote offshore sources, and that the amplification grows as the fault moves seaward. One further finding in the framework of the long-wave theory is that tsunami run-ups and run-downs are independent from the bottom slope, and that wave periods and wave speed decrease and increase with the ocean slope respectively. Finally, we find that for the used idealised sea-floor geometry wave breaking is not expected to occur if the initial wave height in the source region is less than 8-9 m.