Geophysical Research Abstracts, Vol. 7, 10129, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10129

Effects of the Mw 9.0 Sumatra Earthquake and Tsunami on Earth's Shape

H.-P. Plag (1), G. Blewitt (1), C. Kreemer (1), W. C. Hammond (1), and V. Titov (2)

(1) Nevada Bureau of Mines and Geology and Seismological Laboratory, University of Nevada, Reno, Nevada, USA; (2) NOAA Tsunami Research Program, Pacific Marine Environmental Laboratory, Seattle, Washington, USA (hpplag@unr.edu)

Global Positioning System (GPS) observations from the global IGS network are used to investigate geodynamic processes induced by the Mw 9.0 Sumatra earthquake and its subsequent tsunami. The earthquake would have induced change in Earth's shape over a broad spatio-temporal spectrum, including strong motion; permanent co-seismic displacement; surface loading due to the tsunami propagating barotropically through the global ocean; free oscillations of the solid Earth with periods of up to 53 minutes lasting for several days after the initial earthquake; and transient post-seismic deformations lasting from days to years. Initial model calculations of the co-seismic displacement field predict horizontal displacements of >20 mm in the near field (up to 1000 km) and >0.1 mm for the entire Earth's surface. Tsunami-induced loading signals are expected to be of the order of several mm. The free oscillations may have vertical amplitudes of several cm. GPS data are analyzed to determine the global pattern of the 3-d displacement field induced by the earthquake. GPS-determined time series of 3d-displacements with high temporal resolution will be analyzed to determine the geometric amplitudes of the free oscillations and the tsunami load-induced deformations of the earth surface. For the latter, predictions based on modeled sea-level anomalies will be fitted to the global polyhedron of observed displacements. The ultimate goal is to assess the feasibility of using the tsunami-induced changes in the Earth's shape as observed by the regional/global GPS network in improving tsunami models and having it incorporated into a tsunami warning system.