Probabilistic tsunami hazard assessment for the Mediterranean Sea

M.B. Sørensen (1), A. Babeyko (2), M. Spada (3), S. Wiemer (3), and G. Grünthal (1)

(1) GFZ German Research Centre for Geosciences, Section 2.6 Seismic Hazard and Stress Field, Potsdam, Germany
(sorensen@gfz-potsdam.de), (2) GFZ German Research Centre for Geosciences, Section 2.5 Geodynamic Modelling,
Potsdam, Germany, (3) ETHZ, Institute of Geophysics, Zürich, Switzerland

Following several large tsunami events around the world in the recent years, the tsunami hazard in the Mediterranean region is becoming an increasing concern. The traditional way of assessing tsunami hazard has been through deterministic scenario calculations which provide the expected wave heights due to a given tsunami source. For quantitative hazard and risk assessment, however, it is necessary to move towards a probabilistic framework. In this study we focus on earthquake generated tsunamis and present a scheme for probabilistic tsunami hazard assessment (PTHA) for the Mediterranean Sea. Our PTHA methodology is based on the use of Monte-Carlo simulations and follows probabilistic seismic hazard assessment methodologies closely. The PTHA is performed in four steps: First, earthquake and tsunami catalogues are analyzed in order to define a number of potential tsunami sources in the study area. For each of these sources, activity rates, maximum earthquake magnitude and uncertainties are assigned. Following, a synthetic earthquake catalogue is established, based on the information about the sources. The third step is to calculate multiple synthetic tsunami scenarios for all potentially tsunamigenic earthquakes in the synthetic catalogue. The tsunami scenarios are then combined in the fourth step to generate hazard maps for the Mediterranean region and hazard curves for selected sites. The implementation of the PTHA in the Mediterranean Sea will be described. For a 10000 year long synthetic catalogue, ca. 8500 potentially tsunamigenic earthquakes are defined for which propagation scenarios are calculated. Hazard maps based on these scenarios will be presented together with hazard curves for selected locations.