Geophysical Research Abstracts
Vol. 12, EGU2010-5046, 2010
EGU General Assembly 2010

Tsunami hazard, vulnerability and impact assessment of the coastal area of Rabat, Morocco

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Among African countries, Morocco is probably one of the most exposed to tsunami hazard. Indeed, Morocco is integrated in the particular geodynamic context of the northern African margin characterized by the existence of the Azores-Gibraltar fault separating two active tectonic plates: the African and the Eurasian plates. This area generated and still generates many large earthquakes exceeding a magnitude of 6. The Moroccan Atlantic coasts are thus exposed to tsunamigenic earthquakes occurring offshore. Tsunamis generated in this area are not frequent but can be really disastrous and could have a huge impact.

In the framework of the SCHEMA project, a 3 year European project, we studied the consequences on the Moroccan coastal area of two potential tsunami scenarios, applying the generic methodology developed during the project for building tsunami vulnerability and impact maps.

The study focuses on the “Rabat Zaïr” region. Centred on the Bouregreg Valley, this study area encompasses three main coastal and densely populated towns of Morocco: Rabat (capital), Salé and Temara. Using a combination of numerical modelling, field surveys, earth observation and GIS data, the risk has been evaluated for this highly vulnerable area (flat topography, small beaches with many tourists in summer, presence of several bridges on the Bouregreg river separating Rabat and Salé, presence of a dam upstream the 2 cities, and development of a new residential and touristic complex on the coastline and in the vicinity of the estuary).

Two scenarios of tsunami have been studied to estimate the hazard on the coastal zone of Rabat: a worst case scenario based on the historical Lisbon earthquake of 1755 as well as a moderate scenario based on the historical Portugal earthquake of 1969. For each scenario, numerical models allowed to produce inundation maps consisting of inundation limits as well as maximum water heights. Land use data together with earth observation data interpretation allowed then to generate a building classification. Finally potential damages are derived using damage functions developed during the project by Geosciences Consultants (GSC), by crossing information from hazard maps (maximum water elevations) with building vulnerability maps. The damage maps will then serve as a base for elaborating evacuation plans with appropriate rescue and relief processes useful for decision makers, local authorities and investors.