Geophysical Research Abstracts
Vol. 21, EGU2019-9145, 2019
EGU General Assembly 2019

From Geology to Geohazards: A workflow for tsunami hazard assessment in the Gulf of Cadiz

Cristina Sanchez Serra (1), Eulàlia Gràcia (1), Roger Urgeles (1), Laura Gómez de la Peña (2), Sara Martínez-Loriente (3), Manuela Volpe (4), Francesco Maesano (4), Fabrizio Romano (4), and Scala A. Scala A. (5)

(1) Institut de Ciències del Mar (ICM-CSIC), Barcelona, Spain , (2) GEOMAR Helmholtz Center for Ocean Research, Kiel, Germany, (3) Irish Centre for Research in Applied Geosciences (ICRAG), UCD School of Earth Sciences, Ireland, (4) Istituto Nazionale di Geofisica e Vulcanologia (INGV), Rome, Italy, (5) Dipartamento di Fisica, Università di Napoli Federico II

The Gulf of Cadiz is located in the southwestern margin of Iberia, where the slow NE-SW trending convergence between the African – Eurasian plates is of 3.8-5.6 mm/yr. Despite hosting a moderate/intermediate seismic activity, large historical and instrumental destructive earthquakes, such as the 1755 Lisbon earthquake (Mw 8.5) and tsunami, and the 1969 Horseshoe earthquake (Mw 8) occurred. On the basis of turbidite paleo-seismologic studies, we found that great earthquakes of Mw $\geq$ 8 occur in the external part of the Gulf of Cadiz following a recurrence interval of $\sim$1800 years. This study focuses on the active structures located in this area and their potential tsunami hazard. These structures are: a WNW-ESE dextral strike-slip fault (Lineament South) and NW-verging thrust faults such as the Marquês de Pombal, the Horseshoe Fault, the North Coral Patch Ridge Fault, the South Coral Patch Ridge Fault and Gorringe Bank Fault. Using a scenario approach on the basis of geological data acquired in the Gulf of Cadiz during the last 20 years, we are able to determine the locations of highest tsunami hazard along the coasts of the Iberian Peninsula and North Africa. The workflow involves the following tasks: 1. Interpretation of all seismic sections (in time), defining the traces of the main active faults in the area; 2. Mapping the seafloor fault trace on using multibeam bathymetry and a GIS software; 3. Mesh of the fault surface and sub-surface information, and their respective horizons in order to generate a 3D model of the subsurface for each fault; 4. Conversion of the 3D model from time to depth on the basis of available velocity models (i.e. assigning a velocity value to the intervals between horizons); 5. Defining the specific attributes for each fault, such as Length, Width, Depth, Strike, Dip and Rake. 6. Determine the maximum magnitude (Max Mw) that single faults can generate and its maximum slip, which is mechanically compatible with the length and width previously defined (i.e. using the scaling-law of Leonard, 2014). 7. Finally, the tsunami simulations for each fault have been running using Tsunami-HySEA software and considering a simple inclined planar surface for the fault plane (to have a first approach of the tsunami and its affects) and a triangular information for the 3D mesh that represents the real fault geometry and allows us to generate a more realistic and detailed tsunami. On both cases, the parameters defined in steps 5 and 6 have been introduced for each fault. Our results show that all the studied faults of the Gulf of Cadiz can potentially generate a significant tsunami that eventually may severely affect the coasts of SW Europe and NW Africa. The faults with the largest tsunamigenic potential are the Gorringe Bank and the Lineament South, and the most affected areas are the coasts of Morrocco and Algarve.