Geophysical Research Abstracts
Vol. 15, EGU2013-5290, 2013
EGU General Assembly 2013

Numerical simulation of the 2002 Northern Rhodes Slide (Greece) and evaluation of the generated tsunami

Filippo Zaniboni, Alberto Armigliato, Gianluca Pagnoni, and Stefano Tinti
Department of Physics and Astronomy, University of Bologna, Bologna, Italy (filippo.zaniboni@unibo.it)

Small landslides are very common along the submarine margins, due to steep slopes and continuous material deposition that increment mass instability and supply collapse occurrences, even without earthquake triggering. This kind of events can have relevant consequences when occurring close to the coast, because they are characterized by sudden change of velocity and relevant speed achievement, reflecting into high tsunamigenic potential.
This is the case for example of the slide of Rhodes Island (Greece), named Northern Rhodes Slide (NRS), where unusual 3-4 m waves were registered on 24 March 2002, provoking some damage in the coastal stretch of the city of Rhodes (Papadopoulos et al., 2007). The event was not associated with earthquake occurrence, and eyewitnesses supported the hypothesis of a non-seismic source for the tsunami, placed 1 km offshore. Subsequent marine geophysical surveys (Sakellariou et al., 2002) evidenced the presence of several detachment niches at about 300-400 m depth along the northern steep slope, one of which can be considered responsible of the observed tsunami, fitting with the previously mentioned supposition.
In this work, that is carried out in the frame of the European funded project NearToWarn, we evaluated the tsunami effects due to the NRS by means of numerical modelling: after having reconstructed the sliding body basing on morphological assumptions (obtaining an esteemed volume of 33 million m3), we simulated the sliding motion through the in-house built code UBO-BLOCK1, adopting a Lagrangian approach and splitting the sliding mass into a “chain” of interacting blocks. This provides the complete dynamics of the landslide, including the shape changes that relevantly influence the tsunami generation. After the application of an intermediate code, accounting for the slide impulse filtering through the water depth, the tsunami propagation in the sea around the island of Rhodes and up to near coasts of Turkey was simulated via the code UBO-TSUFD: this solves numerically the Navier-Stokes equation in the shallow water approximation, adopting a finite difference technique. It was then possible to estimate the most affected coastal stretches and to assess the effects of the NRS generated tsunami, comparing the computed wave heights with the observations.

Papadopoulos G.A., Daskalaki E., Fokaefs A. (2007) Tsunamis generated by coastal and submarine landslides in the Mediterranean Sea. In: Lykousis V., Sakellariou D., Locat J. (eds.), Submarine Mass Movements and their Consequences, 415-422, Springer.

Sakellariou D., Lykousis V., Rousakis G., Georgiou P. (2002). Slope failure and associated coastal erosion in tectonically active areas: The coastal zone of Rhodes city (Rhodos island) Greece. In: A. Yilmaz (ed.): Oceanography of Eastern Mediterranean and Black Sea, 978-985, Proceedings of the 2nd International Conference Oct. 13-16, TUBITAK Publ., Ankara, Turkey.