



Evaluation of tsunami hazard associated to the Assi submarine landslide along the Ionian Calabrian margin, Italy

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Continental margins are frequently prone to submarine sliding, which constitutes a severe hazard when the slides occur close to the coast and move in shallow water, since they might generate destructive waves. In the Mediterranean Sea, especially, the potential sources of landslide-induced tsunamis are often located critically close to coastal communities, and the knowledge of how the event may evolve together with awareness of the associated risk are key factors for civil protection issues.

A series of recent geophysical surveys carried out by OGS in the framework of The MAGIC (Marine Geohazards along the Italian Coasts) project, brought relevant contribution to the imaging and functioning of submarine landslides. Along the tectonically active Ionian Calabrian Margin (ICM) a multiple failure event has been identified (Assi landslide) at about 6 km away from the coastline nearby Riace Marina: headwall scars, mobilized sediments along the scour, stacked deposits at and near the seabed, at the foot of the slope have been identified. The data allowed to estimate the volume of mobilized material and to reconstruct the failure dynamics. One of the most susceptible areas along the ICM is located in the southern part, around the coastal village of Riace Marina in the province of Reggio Calabria.

The coastal area adjacent to Riace Marina is not a very urbanized settlement, however becomes intensely crowded in the tourist season. The evidence of the occurrence of such an extensive failure event so close to the coast, motivated us to assess the potential tsunamigenic hazard associated to the Assi submarine landslide event in this area. A number of scenarios were considered starting from a more conservative scenario (i.e. a sequence of successive failures) to the most critical case (i.e. a unique big event mobilizing all the sediments at once).

In this work we present the results concerning the worst-case scenario, that is we assume that a single big landslide event occurred and mobilized 1.85 km³ volume of sediments at once. Numerical simulations have been performed using the numerical codes developed by the University of Bologna research team. We have computed the motion of the mass, the tsunamigenic effects of the motion on the sea water surface and the propagation of the tsunami waves. We have assessed the main tsunami features such as travel times, main wave period, polarity of the first arrival, maximum wave elevation, providing a complete picture of the coastal hazard associated to such event. It has been found that the area most affected in this tsunami scenario is the stretch of coast about 25 km long between Roccella Jonica and Monasterace on the eastern side of Calabria. Even if the resulting waves have limited amplitude they can cause relevant damage to the infrastructures located close to the shoreline.