Geophysical Research Abstracts,
Vol. 11, EGU2009-7664, 2009
EGU General Assembly 2009

The Gondola slide generated tsunami in the South Adriatic Sea (Italy)

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Underwater landslides are hardly predictable and, especially if moving near the coast, represent a concrete threat for the population leaving in coastal areas and for infrastructures placed close to the shoreline. In the framework of the EU funded project TRANSFER, a set of possible sources all around the Mediterranean Sea have been mapped. Among the most common source areas there are the continental margins, owing to their steep slope, favouring the gravitational instability of deposited material.

In this work we present the simulation of an ancient event, that occurred during the last glacial age (about 25 kyrs ago), in the Southern Adriatic Sea, known as the Gondola slide. It belongs to the SW Adriatic margin, a margin stretching by about 150 km that is characterized by canyons and widespread failure events that generated slide scars and extensive slide deposits. The most evident slide scar is around 10 km x 2.5 km, at the present-day sea depth of 180 m (but at the time of occurrence the depth was less than 50 meters), with a mobilized volume of around 4.5 km3 and a runout of more than 50 km. Recent bathymetric surveys (high resolution multi beam bathymetry) provided further details on the morphology of the deposit: the upper portion of the slide extends 23 km seaward, down to 800m sea depth, while the distal part is found over 50 km.

In this work we consider the tsunami that very likely was generated by such a big slide. The simulation of the slide motion was performed through the code UBO-BLOCK1, developed by the University of Bologna Tsunami Research Team: The model is Lagrangian and block-based, computing the motion and the deformation of each of the blocks in which the total slide mass is discretised. The generation and propagation of the tsunami was simulated through the hydrodynamic code UBO-TSUFE, solving the Navier-Stokes equations in the shallow-water approximation over a mesh formed by triangular elements.

The tsunami generation efficiency of Gondola Slide is measured through the Froude number and is found to be low. In spite of the small Froude number value, the tsunami was large because the estimated front of the Gondola Slide is very high with initial mass thickness in the order of several tens of meters. The zone most affected was the coastal region close to the source, that was hit by a long series of waves higher than 8-10 m with period between 15-20 min. The rise of sea level to its present position would lead to reduce the Froude number. Therefore, for a slide like Gondola Slide in identical conditions, but with the today's ocean depth, the associated tsunami would be quite smaller.