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Numerical modelling of the 1979 Nice landslide-generated tsunami

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On the 16th October 1979, a part of the building site of the Nice airport extension intended to become the new Nice harbour collapsed into the Mediterranean Sea during landfilling operations. This submarine slide of initial volume of 10 millions of m^3, located near the seashore, generated a turbidity current that propagated along the Var canyon. A few minutes after the landslide, a small tsunami was observed by several witnesses 60 km along the coast, called "Baie des Anges". The most destructive effect occurred near the city of Antibes, 10 km away from the source, which was inundated and where one person died.
In the framework of the RATCOM (Réseau d'Alertes aux Tsunamis et COtiers en Méditerranée) project, this event is numerically simulated with the goal of establishing the appropriate monitoring network which could have detected this event by means of gauges located offshore. Two additional scenarios of hypothetical sources recently identified by IFREMER in the same area are also computed : a small volume of 0.6 millions of m^3, close to the 1979 breakdown area, and a larger one of 7 millions of m^3, located easterly. A very accurate bathymetric map of the area provided by IFREMER and completed by SHOM data near the coast is used.
The dynamics of the slide and the water waves generated are both computed in the shallow water approximation, considering the interaction between the mass of sediments constituting the slide and the water. The landslide is modelled as a Newtonian homogeneous viscous flow sliding under gravity along the bathymetry and the tsunami model is initialized by taking into account the bottom deformation induced by the slide. Incorporation of water in the mass of sediments at the interface between landslide and water can be considered. The equations are solved by a finite difference method based on shock capturing.
Numerical results of tsunami waves amplitudes generated by the landslide during the propagation and along the coast are compared to witnesses observations and available tide gauges signals. Local effects in front of the Nice airport are well reproduced with consistent wave polarity, arrival time and amplitude. However, in the far field, results are not in agreement with observations, in particular, simulated wave amplitudes are too small to inundate Antibes city. Water entrainment inside the slide increases these amplitudes. Further developments will involve better refinement around Antibes city.