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Earthquake or landslide-tsunami? Discriminating the source type by the effects on the coast

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Tsunamis generated by earthquakes and by landslides, in general, differ from each other for the energy involved in the generation phase: earthquake faults can have dimensions of several tens or hundreds of km, meaning that a huge mass of water is mobilized, while a landslide involves a less amount of water mass in the source. This influences some features of the tsunami propagation, such as the frequency of the wave and its shape.
On the other side, in absence of specific instrumentation such as tide gauges or buoys, the only achievable data describing the tsunami can be obtained from observing coastal effects, such as run-up and inundation.
In this work, performed in the framework of the EU-FP7 project ASTARTE, a tentative approach is presented to recognize the source type (earthquake-landslide) from the respective tsunami features along the coast. Using ideal cases with simplified sea bottom morphology and a linear coastline, landslide and earthquake sources, located in the same position, are considered. The landslide motion is computed by means of the in-house developed code UBO-BLOCK1, providing the complete dynamics of the moving mass and the consequent tsunamigenic impulse. As concerns earthquake generation, an instantaneous water surface displacement is considered as a result of the sea bottom seismic deformation. The corresponding generated tsunamis are then simulated by means of the finite-difference code UBO-TSUFD. Finally, the sea water elevations along the coastline are evaluated, comparing the different shapes for the landslide and the earthquake-generated tsunamis.
The two types of tsunamis show a different trend in the lateral attenuation with respect to the central point, that is the position along the coastline located in front of the source. One of the most relevant issues is the role played by the coastal shelf and margin in determining the tsunami wave height on the coast. It is seen that differences between tsunamis are larger or smaller depending on the shape of the shelf profile, so that discrimination of the sources in some cases is easy, while in others can be problematic.