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Assessing of site-related changes of tsunamis impacting closed ocean basins

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Tsunamis are long waves that travel across the ocean and are capable of carrying destructive energy over very long distances. Studying their propagation path and the complex way they interact with local bathymetries is of fundamental importance for predicting their impact on the coast and for hindcast analyses.
This work is focussed on the influence of closed sea basins on the tsunami propagation. By closed basins we mean here any basins capable of modifying significantly the tsunami signal with respect to the surrounding open sea. Here two different methodologies are applied to two relevant examples: the Seychelles Island platform, that was impacted by the 2004 Indian Ocean megatsunami, and the Messina Strait, Italy, that was affected by several severe tsunami events, the last one taking place in 1908.
In the first case, in the framework of EU- funded SCHEMA (Scenarios for Hazard-induced Emergencies Management) project, through the analysis of synthetic/real tide-gauge records of the 2004 simulated/observed tsunami, it is shown that the deep-ocean Seychelles-platform transition changes the spectral distribution of the tsunami energy with peak signal amplification of selected peaks, which is linked both to the platform bathymetric configuration and to coastal geometry of the islands.
The Messina Straits is a sort of a channel connecting the Tyrrhenian sea to the Ionian sea and including some sub-basins, like the Messina harbour. To study the effect of the channel on the tsunami propagation, numerical simulations were used to force the basin along different boundaries with sinusoidal functions having different periods within the range of typical tsunami frequencies. The computed amplification curves show that the main resonance period is approximately 10 minutes all over the Straits, but reveal that the response change from place to place and identify those places that are most sensitive to tsunami attacks.