



The problem of the 1908 Reggio and Messina earthquake and tsunami sources. A geomorphic perspective

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The 28 December 1908 Reggio Calabria and Messina earthquake (from the name of the two most severely damaged cities on the coasts of Calabria and Sicily, respectively) was one of the strongest and most catastrophic ever experienced in Italy (Mw 7.1); it also triggered a tsunami that made even worse the catastrophic effects, the number of victims being estimated between 80.000 and more than 100.000 (depending on different sources and estimates).

Based on both instrumental reconstructions and detailed fieldwork (from which resulted no evidence of coseismic fault scarps on land), most workers agree that the earthquake was generated by an offshore normal fault dipping roughly to the east, thus causing overall E-W extension within the Messina Straits. Alternatively, a W-dipping normal fault or a combination of E- and W-dipping faults have been also proposed.

In all these models the length, width and strike of the fault vary in a way that is acceptable for a century-old earthquake; nevertheless such variability betrays the uncertainty as to the exact location of the fault. Moreover, modelling of tsunami (based on arrival time and available runup and flooding data at different localities) seems overall unfitting for most of the proposed faults, and some authors have suggested that the 1908 tsunami was generated by a landslide; however, these Authors do not support the landslide-generated tsunami hypothesis with high-resolution morpho-bathymetric data.

Recently, the area of the Messina Straits has been mapped by means of high-resolution swath bathymetry within the Italian project MAGIC (Marine Geohazards along the Italian Coasts), promoted by the National Civil Protection Department and aimed at producing detailed morpho-bathymetric maps as a base for geohazard interpretation (<http://www.magicproject.it>). The primary regional morpho-structural feature in the Messina Straits appears to be the axial channel of the Messina Canyon, toward which flow lateral canyons that incise the slope on both sides of the Straits. Upslope, these canyons deeply cut into a very narrow (almost absent) continental shelf on both sides of the Straits and merge into an almost continuous, erosional margin that borders the Messina Canyon as a giant, composite headscarp; this makes of the Messina Canyon a quite unique geomorphic feature. A multitude of local to sub-regional erosional and depositional processes superimpose on this overall canyon-dominated setting, resulting in a complex geomorphology that hinders the distinction between tectonic (e.g. fault scarps) and depositional/erosional features.

Notwithstanding this complex setting, we emphasize the possible contribute from detailed geomorphic mapping of the seafloor to the problem of the many uncertainties that affect the identification of the 1908 Reggio Calabria and Messina earthquake and tsunami sources, an issue still lively debated.