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Patterns of seafloor morphology as a response to tectonic- and sedimentary processes south of the Messina Strait, Italy

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The Ionian Sea between Sicily and Calabria is known for its complex geological setting, as it is located at the convergence zone of the African and Eurasian plates. The seismogenic potential in this region is manifested by several high magnitude and disastrous earthquakes like the 1908 Messina Earthquake. Furthermore, the area is affected by intense volcanism like the Aeolian Island volcanos in the Tyrrhenian Sea and Europe's largest active volcano, Mt Etna, sitting directly at the eastern coast of Sicily. During the last years, the possible presence of Subduction Tear Edge Propagator faults (STEP-faults) has been heavily debated. The main candidates for these faults are the Ionian Fault in the Northeast and the Alfeo-Etna Fault in the Southwest of the working area between Sicily and Calabria. Nevertheless, only little is known about near seafloor deformation zones and sedimentary processes in the Ionian Sea directly south of the Messina Strait.
In order to obtain a better understanding of the sedimentary processes and the role of tectonics in the region, a new high-resolution 2D reflection seismic dataset was acquired during POS496 cruise during March – April 2016. In combination with existing additional seismic and bathymetric data, we mapped the area in terms of sedimentary and tectonic systems between Sicily and Calabria south of Messina Strait. The overall aim is to understand the relationship between tectonics and sedimentary processes in this complex geological area.
The entire working area shows a variety of submarine channels, evolving from the central Messina Strait Canyon. In addition, large syn-tectonic south-north trending half grabens and sedimentary basins are imaged. The basins are filled by turbiditic- and contouritic deposits. Furthermore, several anticlines and negative flower structures were identified. We interpret these tectonic lineaments as the surface expression of deeply rooted transpressive- and transtensional fault systems. These fault systems with large strike-slip components could be near surface indicators for the proposed STEP Faults in the region.
Not all morphological features like canyons/channels and structural heights follow significant tectonic lineaments. This indicates that some sedimentary features are decoupled from tectonics and are rather the expression of long lasting sedimentary processes like turbidity currents, mass transport events and bottom current activity.