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Deformation along the eastern flank of Mount Etna: hints from offshore multichannel seismic survey

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The eastern flank of Mount Etna shows clear evidence of active flank dynamics, although, so far, the nature and extent of volcano-tectonic processes have not been fully understood. In order to explain the observed flank deformation, different models have been proposed, which are mostly based on, or compared to, onshore structural data. The eastern flank of Mount Etna, however, presents a remarkable topographic step towards the Ionian Sea, where a water depth close to 1 km is reached not far from the coastline. Evidence of gravitational instability has been reported along the offshore extent of Mount Etna, although with limited documentation, suggesting that some kind of gravitational dynamics can affect also to this region.

The onshore flank deformation appears to be laterally confined by two guidelines, trending roughly E-W, located to the north and south of the deforming flank. These guidelines may take the surface expression of sharp faults, particularly in the northern boundary (Pernicana Fault), and in several kinematic models these faults are thought to continue offshore.

This contribution aims at describing the deformation present offshore Mount Etna using multichannel seismic profiles recently acquired during three seismic surveys. The main objective, in particular, is the study of the offshore prolongation of the Pernicana Fault.

The seismic profiles are mainly targeted to high resolution, with record length ranging between 2 and 6 seconds, but deep features have been also imaged.

Seismic profiles show various kinds of gravitational instabilities, operating at different scales, along the offshore extent of Mount Etna. In some instances, the control of deep structures on gravitational deformation can also be observed. The data also show that the Pernicana Fault is not continuing offshore as a sharp feature, but rather that a more complex deformation is occurring.

The implications that our study bears on the large-scale dynamic of the eastern flank of Mount Etna will be also discussed.