



Deformation of Mount Etna substrate as imaged by offshore seismic profiles

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Despite the clear evidence of active flank dynamics that is affecting the eastern side of Mount Etna, the contribution of tectonic processes has not been yet understood. So far, the various models proposed to explain the observed flank deformation have been based on onshore structural data, coming from the volcanic edifice. The Ionian offshore of Mount Etna has been only recently investigated using multichannel seismic profiles, and offers the opportunity to image the structural features of the substrate of the unstable flank of the volcano. This contribution aims at describing the deformation located offshore Mount Etna using multichannel seismic profiles recently acquired during three seismic surveys (Argnani and Bonazzi, 2005; Pareschi et al., 2006; Argnani et al., 2009). These surveys total over 800 km of high resolution seismic profiles, with record length ranging between 3 and 6 seconds and spatial coverage varying from 16 to 48 folds.

The flank deformation of Mount Etna appears to be laterally confined by two tectonic guidelines, trending roughly E-W, located to the north and south of the deforming flank; the northern guideline, in particular, takes the surface expression of a sharp fault (Pernicana Fault). Though often assumed that these boundary structures continue offshore as linear features, connected to a frontal thrust ramp (i.e., Borgia et al., 1992), the occurrence of this simple offshore structural system has not been imaged. In fact, seismic data show a remarkable degree of structural complexity offshore Mount Etna. The Pernicana Fault, for instance, is not continuing offshore as a sharp feature; rather, the deformation is expressed as ENE-WSW folds located very close to the coastline. It is possible that these tectonic structures might have affected the offshore of Mount Etna before the Pernicana Fault system was developed, less than 15 ka ago. The southern guideline of the collapsing eastern flank of the volcano is poorly expressed onshore, and does not show up offshore; in fact, seismic data indicate that the Catania canyon, a remarkable E-W-trending feature, does not reflect a tectonic control.

Seismic interpretation also shows the occurrence of a structural high located just offshore the edifice of Mount Etna. Whereas a complex deformation affects the boundary of this tectonic element, it shows only limited internal deformation. Preliminary results led to interpret this structural high as the northernmost extent of the Hyblean foreland. The role of this element in the volcano-tectonic evolution of the region is currently under investigation.

References

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