



Deep crustal structure of the Calabrian Arc from multichannel seismic images

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The NW subduction of the African plate below Eurasia results in the formation of the Calabrian Arc System with a forearc area characterized by a thick sedimentary wedge located in the Ionian Sea, and a backarc basin located in the Tyrrhenian Sea. To better understand the deep crustal structure of this convergent margin and the main tectonic features, we focus on the forearc area in the Ionic Sea where several multichannel seismic (MCS) lines were acquired during the CHIANTI-2015 and CROP-1995 cruises.

An ensemble of four MCS lines images the frontal region of the forearc along a transect from the African margin to the Apulian Platform. In the western limit, the seismic images show steep slopes of the Malta Escarpment in the African Margin and softer slopes with normal faulting toward the south. No clear basement reflection is observed toward the continental platform. At the foot of the slope, several sedimentary sequences are recognized and easily followed until the Ionian Abyssal Plain. The deepest Mesozoic carbonate units are imaged by a 1.5-twts-thick package of high amplitude and low frequency reflections, stratified and continuous. Overlying, the Tertiary clastic units are characterized by a 1-twts-thick layer of stratified reflections with semitransparent facies topped by a high reflectivity limit corresponding to Lower Messinian evaporites. These units are covered by the Upper Messinian evaporites of the wedge that present a semi-chaotic facies. Finally, fine stratified reflections of Plio-Quaternary sediments are covering the whole area.

Towards the middle of the wedge, a main deformation feature is imaged. Here, the Messinian wedge deposits and the horizontally stratified Mesozoic and Tertiary units sharply appear deformed with imbricate slices and duplex structures that gradually become wider and lose reflectivity towards the Apulian Platform in the NE. This abrupt change indicates the presence of a major sub-vertical tectonic limit that seems to extend landward until the southernmost Calabrian margin and may explain the two-lobe morphology of the wedge. This difference in deformation between NE and SW lobes is also observed landward through MCS lines perpendicular to the Calabrian margin. In the SW lobe, the Mesozoic unit is continuous at ~8-9 twts until the presence of a main thrust fault that separates the inner and the external zones of the wedge. Below the inner wedge this unit is imaged at ~10-11 twts. In contrast, in the NE lobe the sedimentary wedge is thicker due to thrusting accretionary structures and the Mesozoic-Tertiary deformed units are imaged deeper, at ~9-10 twts below the external wedge and at ~11-12 twts below the inner wedge.

In the north limit, the Apulian Platform is characterized by a thick package of Jurassic-Cretaceous carbonates overlaid by a 0.2 to 0.5-twts-thick layer of Messinian carbonate and evaporitic deposits, and covered by a finely and well stratified blanket of Plio-Quaternary sediments. Seismic images show this Apulian sequence sloping to the southwest, locally affected by seaward normal faulting, subducting below the Plio-Quaternary and Messinian wedge sediments, and probably also below the Tertiary units.