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The Ionian Abyssal Plain – a key region for understanding the formation of the central Mediterranean domain

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The Ionian Abyssal Plain (IAP), located in the Central Mediterranean area is surrounded by the Medina Ridges to the South and by two subduction zones, accommodating the slow convergence between Africa and Eurasia: one beneath Calabria to the NW and the second beneath Greece to the NE. The present-day position of the IAP results from the long-term evolution of the western Tethys. Most paleographic reconstructions interpret the Ionian Abyssal Plain as the last remnant part of a late Triassic oceanic basin, which attained its current configuration due to subduction and roll-back of the Ionian lithosphere during the last 30 Ma.

We present the pre-stack depth migrated PM01 line, a multi-channel seismic profile acquired during the PRISMED cruise (1993), onboard Le Nadir and the most relevant lines time-migrated of the ARCHIMEDE multi-channel seismic cruise (1997, R/V Le Nadir) crossing the Ionian Abyssal Plain and the Calabrian subduction zone. Beneath the IAP, we identify a thick sedimentary cover (> 5km), deposited over the Ionian oceanic crust. The deformation of these Jurassic to Plio-Quaternary age sediments has two different tectonic origins: 1) Thick skinned (crustal scale) NW vergent reverse faulting affecting the pre-salt deposits and, 2) Thin skinned SE vergent thrust faulting caused by the accretion of post-salt deposits.
1) Large-scale thrust anticlines (wavelength 10 to 20 km), with short and steep forelimbs allows the identification of a set of 50°NE striking reverse faults, mostly NW vergent. These faults affect the entire sedimentary cover from the oceanic basement to the pre-salt unit. We identify well-developed syn-tectonic basins, NW of these faults, with onlapping growth strata, Oligocene or Tortonian in age, depending on the references used to correlate the seismic horizons. In comparison with similar tectonic settings (Central Indian Ocean), these 50°NE oriented features are interpreted as a re-activated set of normal faults, possibly formed during rifting and/or subsequent accretion of Ionian oceanic crust. The orientation of the subbottom structures, in the continuation of the Medina Ridges South of the IAP may be linked with the presence of these faults and their activity through time.
2) On the Calabrian side of the IAP, the Messinian salt and the Plio-Quaternary (PQ) sediments are accreted to the Calabrian prism. The weak rheology of the salt allows the formation of a décollement level at the base of the salt unit in the frontal part of the wedge. Repeated imbricate thrusting and some back-thrusting within in the Calabrian wedge allow a doubling of the thickness of the salt layer within 30 km of the deformation front.
Furthermore, east of the toe the Malta Escarpment (East Sicily), another major tectonic structure is imaged by the Archimede profiles. The structure offsets the top of the Pre-Messinian deposits and the underlying units by 0.5 - 1 sTWT increasing from S to N. This N150°E oriented lithospheric scale fault is interpreted as a tear fault ("STEP" fault) which has allowed the roll-back of the Ionian slab.

The timing and the geodynamic explanation of the re-activation of the 50°NE set of faults depends on the age chosen for the syn-tectonic sequence, this work is in progress. The interaction between the activity of the tear fault and the synchronous formation of the westernmost side of the Calabrian prism has also to be better understood. The timing of activity of these adjacent features is a key problem to better constrain long-term and recent evolution of the western Mediterranean domain.