



Shortening vs extension in the Aspromonte nappes-pile (Calabria, Italy). New insights from structural and geochronological data.

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In the Calabrian Arc (Southern Italy), the tectonic pile is made of Hercynian crystalline rocks and Alpine ophiolitic-derived rocks, resting on top of the Apennian and Sicilian sedimentary thrust belts. This tectonic edifice was built up during the Cenozoic convergence between the Eurasian and African plates. It is partly coeval with the opening of the Mediterranean Liguro-Provencal basin since Oligocene times. Several thickening events have been recorded in the Calabrian Arc, but syn-orogenic extensional structures are also described all along the Arc.

In the southern part of the Calabrian Arc (Aspromonte massif), three stacked tectonometamorphic units are recognized. The lower one (Africo-Polsi Unit), mostly made of meta-sedimentary rocks is tectonically overlain by a crystalline basement sheet and its Meso-Cenozoic sedimentary cover (Aspromonte and Stilo units). Structural and thermochronological data suggest that this tectonic edifice results from a two steps Alpine tectonics, which has partially reset Hercynian minerals. The first step corresponds to a top-to-SE shortening event, also identified in the Silician Peloritani Mountains. The second step corresponds to a top-to-NE extensional deformation, observed along the whole tectonometamorphic pile. In the lower part of the pile, extension is expressed by the reactivation of the former Aspromonte Unit thrust contact. In the upper part of the pile, a large detachment fault is evidenced, which separates

the Aspromonte and Stilo units. From South to North, this low-angle fault is observed from the paleo-ground surface to deeper ductile levels. In the shallowest part, it is associated with heterogeneous brecciation of both the hangingwall and footwall, while in the deepest part it is marked by diffuse ductile structures more difficult to observe.

Geochronological data available in this area are Rb-Sr ages on phengites, ranging from 331 to 22 Ma (Bonardi et al., 1987), and FT ages ranging from 299 to 18 Ma (Thomson, 1994). Our new $^{40}\text{Ar}/^{39}\text{Ar}$ data better constrain the Alpine kinematics and indicate two main episodes of exhumation:

- Ages around 33 Ma obtained on phengites from the lower unit evidence an exhumation probably following the piling of the Calabrian Arc units during Upper Eocene / Lower Oligocene.

- Ages around 28 Ma obtained on synkinematic phengites in the deepest levels of extensional shear zone and on K-feldspars from the intermediate unit are clearly associated to the stretching and thinning of the tectonic pile. This latter extension episode is probably related to the south-eastward retreat of the subduction, accounting for the opening of the first Mediterranean basin. These ages correspond to the Upper Oligocene age of the first transgressive sediments deposited on the Aspromonte massif.

These geochronological data bring to light a very sharp transition between the two different exhumation processes around 30 Ma.