Variscan tectonics in Dodecanese, Kalymnos island, Greece

Eleftheria Chatziioannou (1), Bernhard Grasemann (1), David Schneider (2), Bernhard Hubmann (3), and Konstantinos Soukis (4)

(1) Department of Geodynamics and Sedimentology, University of Vienna, Austria, (2) Department of Earth Sciences, University of Ottawa, Canada, (3) Institute of Earth Sciences Karl-Franzens, University of Graz, Austria, (4) Faculty of Geology and Geoenvironment, National and Kapodistrian University of Athens, Greece

Kalymnos island is located in the Dodecanese, southeastern Aegean Sea, and geologically appears to be part of the external Hellenides. Pre-Alpidic basement rocks on the Dodecanese islands have been suggested to record compelling similarities with the basement rocks in Eastern Crete with respect to their lithologies and pre-Alpidic metamorphic evolution. The lithotectonic units experienced greenschist to amphibolite facies conditions during the Variscan orogeny. Whereas the rocks in Eastern Crete reveal Alpine high-pressure overprint, the Variscan basement units in the Dodecanese record no or low-grade Alpine metamorphism.

A field study of basement rocks below Mesozoic limestones and dolomites in the NW part of Kalymnos near Emporios uncovered a complex history of metamorphism, folding and faulting. Three different tectonic units can be discriminated from top to bottom: a) a quartz-mica schist, b) a white-grey, fossiliferous coarse grained marble and c) a fine-grained fossiliferous blue-grey marble. In the marbles macrofossils such as brachiopods, ammonoid cephalopods (Goniatids?) and crinoids suggest a Middle-Upper Devonian deposition age (Givetian-Frasnian).

Structural mapping the area resolved a dominant W-E shortening event, resulting in an overall inverted metamorphic gradient. The lowermost blue-grey marble unit is folded into large-scale upright folds, which are truncated by top-to-east overthrusting of the white-grey marble unit. Whereas deformation mechanisms in the blue-grey marble unit are dominated by dissolution-precipitation creep, the white-grey marble suffered intense crystal plastic deformation with localized high-strain mylonitic shear zones. The uppermost quartz-mica schist unit is separated from the lower units by a cataclastic phyllonitic shear zone. 40Ar/39Ar geochronological dating on white micas from the quartz-mica schists yielded cooling ages between 240 and 334 Ma indicative of Variscan cooling. Our data suggest that this part of the Dodecanese experienced intense Variscan deformation with no high-temperature Alpine overprint.