Geophysical Research Abstracts
Vol. 18, EGU2016-11909, 2016
EGU General Assembly 2016

Tectonometamorphic record in a fossilized subduction channel: insights from the Cycladic Blueschist Unit (Cyclades, Greece)

Valentin Laurent (1,2,3), Vincent Roche (1,2,3), Laurent Jolivet (1,2,3), Pierre Lanari (4), Romain Augier (1,2,3), Stéphane Scaillet (1,2,3)

(1) Université d'Orléans, ISTO, UMR 7327, 45071, Orléans, France, (2) CNRS/INSU, ISTO, UMR 7327, 45071 Orléans, France, (3) BRGM, ISTO, UMR 7327, BP 36009, 45060 Orléans, France, (4) Institute of Geological Sciences, University of Bern, Baltzerstrasse 3, CH3012 Bern, Switzerland

The comprehension of subduction dynamics is partly based on the reconstruction of detailed Pressure-Temperature-time-deformation paths of HP-LT metamorphic rocks, which have undergone a complete burial-exhumation cycle. The Cycladic Blueschist Unit (CBU), located in the Aegean domain (Greece), is one of the best examples of a fossilized subduction channel. The tectonometamorphic history of this domain can be summarized in two successive episodes: (1) From the Paleocene to the Eocene, the formation of the Hellenides-Taurides belt due to the convergence between Eurasia and Africa. During this episode, the entrance of the Apulian crust in the subduction zone led to an episode of crustal thickening and formation-exhumation of HP-LT metamorphic units like the CBU. (2) From the Early Oligocene, consecutively to the retreat of the African slab, back-arc extension affected the previously thickened crust and the Aegean Sea started to form.
Syros and Sifnos islands are worldwide known for their excellent preservation of HP-LT parageneses in the CBU, providing one of the best case-studies to understand the tectonometamorphic evolution of a subduction channel. This study aims to decipher the P-T-t-d path of the CBU using for the first time on Syros, Raman spectroscopy of carbonaceous material to constrain metamorphic peak temperature (Beyssac et al., 2002) and a quantitative X-ray micro-mapping approach together with the program XMapTools (Lanari et al., 2014). The micro-mapping tools allowed extracting local chemical compositions observed in zoned garnets to calculate the local effective bulk composition. Forward models are then created to constrain P-T conditions of crystallization of these local assemblages. This study brings new data on the debated metamorphic peak conditions of the CBU, which undoubtedly attained at least 20 $\pm$ 2 kbar / 530 $\pm$ 50°C. Additionally, the geological and metamorphic maps of Syros and Sifnos have been totally redrawn in order to decipher the structure of a fossilized subduction channel. Based on structural and petrological observations, the CBU has been subdivided into subunits separated by major ductile shear zones. The Vari Detachment, interpreted as the Eocene subduction channel roof, separates these HP subunits from the overlying Vari Unit that has not seen HP-LT conditions. We show that after the prograde top-to-the S/SW shearing deformation, the CBU was exhumed by an overall top-to-the E/NE shearing from the depth of eclogites all the way to the depth of the greenschist-facies. Finally, considering geochronologic data from the literature, we propose a possible P-T-t-d evolution scenario of the CBU in the context of the Hellenic subduction by reconstructing step-by-step north-south cross-sections of the Aegean domain from Late Paleocene (~55 Ma) to the present-day geometry. This tectonometamorphic evolution shows how strain localizes during the history of an accretionary complex, both during the prograde and retrograde paths.