



Tectonic evolution of the Cycladic Blueschist Unit and Cycladic Basement with multiple geo-thermo chronometers, Sikinos and Ios, Greece

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The Cycladic islands of Greece expose an assemblage of HP/LT metamorphic rocks that record processes related to both Paleogene subduction along the Hellenic Trench and Oligo-Miocene backarc extension and metamorphic core complex formation. Sikinos and Ios islands are located in the southern Cyclades and contain the Cycladic Blueschist Unit (CBU), consisting of metapelite, metabasite and marble and the tectonically underlying Cycladic Basement (CB) composed of Late Paleozoic felsic plutonic rocks and Early Paleozoic metasedimentary country rock. The contact between the two units has previously been described as an extensional shear zone, as a subduction-related thrust fault that was reactivated as an extensional top-to-the-N detachment, or as a depositional contact prior to subduction. This study presents geo and thermo-chronometers to elucidate the tectonic evolution of the CBU and CB and the role of the contact between the two units during backarc extension. (1) Zircon and apatite depth profile U-Pb and trace elements LA-ICP-MS analyses were used to understand timing and tectonic processes of subduction related deformation, metamorphism and metasomatism on both islands. (2) Zircon and apatite (U-Th)/He provide insight into the late-stage cooling and exhumation history of the CBU and CB, and the role of the contact between the two units during Miocene backarc extension on Sikinos. The depth-profile LA-ICP-MS analyses reveal two distinct generations of metamorphic zircon rims with early Eocene and Oligocene ages. In addition to previously published provenance similarities, metamorphic zircon rims at 50 Ma in the CBU and apatite U-Pb rim ages at 50 Ma in the CB support the scenario in which the two units were either in a depositional contact prior to subduction or juxtaposed during subduction. Oligocene metamorphic zircon rims occur in both CBU-CB restricted to a zone along the contact and likely related to garnet break down during Oligocene metasomatism, possibly related to the High-Temperature metamorphism in the Cyclades. Late Miocene zircon (U-Th)/He ages from CB and CBU on Sikinos are statistically indistinguishable and record rapid exhumation in response to top-to-the-N detachment faulting. Late Miocene to Pliocene apatite (U-Th)/He ages from the CB on Sikinos record the final tectonic exhumation along NE-SW high angle normal faults linked both to crustal scale detachments acting in the area and to Anatolian extrusion.