

Exhumation of high-pressure rocks in an Aegean back arc metamorphic core complex

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Tectonic processes that exhume high-pressure metamorphic rocks from great depths in syn-convergent back-arc settings are not well known. Miocene syn-convergent back-arc extension in the Attic-Cycladic Crystalline Belt of the Aegean Sea is often used as a proxy for understanding detachment faulting and is a key area for observing the mechanisms that influence the exhumation of high-pressure rocks in metamorphic core complexes. Two different exhumation mechanisms have been proposed: subduction induced extrusion-wedge underplating and low-angle normal fault extension.

The islands of Andros, Tinos, and Evia in the Attic-Cycladic Crystalline Belt of the Aegean Sea are ideal settings for understanding how critical low-angle normal faults assist or influence high-pressure rock exhumation. Tinos is a Cordilleran-style metamorphic core complex consisting of the classic Cycladic Blueschist Unit, high-pressure rocks, exhumed along several low-angle normal faults in the North Cycladic Detachment System. On Evia, the Cycladic Blueschist Unit exists in nappe stacks exhumed by an extrusion wedge during thrusting. A low-angle normal fault on the island of Andros has been considered part of the North Cycladic Detachment System, but the temporal evolution of thrusting and extension has not yet been explored. Andros is ideally positioned for a detailed high resolution geochronological, thermochronological, and structural study to examine the spatiotemporal transition of kinematic and thermal regimes in the area from Tinos to Evia. Here we present new U-Pb-He and (U-Th)/He geo-/thermochronometry and U-Pb detrital zircon ages from Andros and Tinos combined with structural observations contradict existing models for structural evolution of the study area. These new data help elucidate the magnitude, temporal, and spatial variability of these two fundamental tectonic processes in exhuming the Aegean back arc high-pressure rocks.

Keywords: Cycladic Blueschist Unit, Aegean, Andros, low-angle normal fault, extrusion wedge, metamorphic core complex, low-temperature thermochronology, exhumation, high-pressure rocks