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# A new metamorphic map of Syros Island (Aegean Sea, Greece): implications for strain localization from prograde to retrograde path

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The Aegean domain is located in the eastern part of the Mediterranean and has undergone a complex Alpine history that can be summarized in two successive episodes: (1) The formation of the Hellenides-Taurides belt due to the convergence between Eurasia and Africa; during this episode, a series of oceanic and continental nappes entered the subduction zone and were thrust on top of each other in a HP-LT metamorphic context. (2) From 35-30 Ma, an acceleration of slab retreat led to the collapse of the belt and the formation of large detachments. The island of Syros (Cycladic Blueschists belt) is worldwide known for the excellent preservation of HP-LT tectonic and metamorphic features associated with these processes, possibly providing one of the best places to study the deformation and metamorphic evolution of the subduction interface. Syros has recorded a complex deformation history during both the prograde and retrograde phase that resulted in the juxtaposition of two main units: (1) the Cycladic Blueschists Unit (CBU), and (2) the Vari unit cropping out in the SE of the island. Conflicting tectonic interpretations have been proposed to explain the evolution of the island, in part reflecting the lack of consensus about the detailed tectonic structure of the CBU. A new geological and metamorphic map of Syros is proposed to better characterize the different structures related to prograde and/or retrograde deformation stages.
High-resolution field-mapping, combined with detailed structural-petrological observations, allows us to subdivide the CBU into three sub-units separated by major ductile shear zones. From top to bottom, these are: 1) the Kampos, 2) the Chroussa, and 3) the Posidonia units. Each of these units experienced similar peak eclogite-facies conditions (ca. 20 kbar - 550 °C), variably overprinted under blueschist- and greenschist-facies conditions across the nappe pile. New ductile structures have been discovered. Among those, a new large-scale top-to-the east greenschists shear zone is recognized between the Posidonia and Chroussa units. Moreover, the contact between the Chroussa and Kampos units records a multi-stage structural evolution. It was first initiated during burial with the development of a N-S trending stretching lineation, characterized by top-to-the south shear sense. The contact was later reactivated during exhumation as a top-to-the east blueschist-facies ductile shear zone. New insights on the Vari detachment, which juxtaposes the Vari unit on the CBU, show a blueschists- to greenschists transition with coherent top-to-the-east shear sense. Whereas retrograde top-to-the east overprint is widespread across the island, the prograde deformation has been preserved only locally, particularly within the Kampos unit. We infer that, after the prograde top-to-the south deformation, the CBU was exhumed by an overall top-to-the east shearing all the way up from eclogite- through greenschists-facies depths and, finally, into the brittle crust. During exhumation, deformation progressively localized along several large-scale ductile shear zones, allowing preservation of earlier HP-LT structures and metamorphic parageneses. Finally, retrograde deformation was further localised in the lower part of the CBU, where HP-LT parageneses are largely overprinted in the greenschists facies.