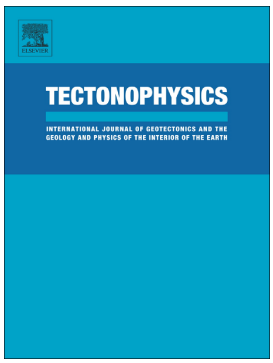

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Shuyun Cao, Franz Neubauer, Manfred Bernroider, Johann Genser

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Eocene high-pressure metamorphism and Oligocene retrogression on Naxos, Cyclades, Greece: Significance for Aegean tectonics and $^{40}Ar/^{39}Ar$ dating in polyphase metamorphic rocks

Shuyun Cao[1,2*], Franz Neubauer[2], Manfred Bernroider[2], Johann Genser[2]

[1]*State Key Laboratory of Geological Processes and Mineral Resources, Center for Global Tectonics, School of Earth Sciences, China University of Geosciences, Wuhan 430074, China*

[2]*Dept. Geography and Geology, University of Salzburg, Hellbrunnerstr. 34, A-5020 Salzburg, Austria*

Abstract

In this study, we report new microfabrics, pressure–temperature estimates and $^{40}Ar/^{39}Ar$ ages from high-pressure (HP) rocks of southeastern Naxos in Cyclades, Aegean Sea. Most metapelitic rocks contain two generations of white mica, high-Si phengites crystallized during HP metamorphism and low-Si white mica formed during subsequent retrogressive overprint. $^{40}Ar/^{39}Ar$ white mica dating of five white mica samples yielded ages of ca. 51–40 Ma, with a mean at 45 Ma for the peak pressure conditions and ca. 35–29 Ma for the retrogressive greenschist-facies overprint, as well as ca. 16 Ma for the strongly sheared rocks. Even though the overprint at the greenschist-facies conditions is at ca. 350°C and 5 kbar, the phengite ages show that the white mica still records the age of the HP metamorphism. This implies that further factors such as deformed microstructure processes and fluid flow along with temperature-controlled diffusion contributed to Ar loss. The age and conditions of this first stage of greenschist-facies overprint at 35–29 Ma are similar over a large area of the southern Aegean Sea. This event represents an exhumation event, when the continental Adriatic microplate entered the subduction zone. The greenschist-facies marked a thermal pulse during exhumation. Stacking of passive margin cover successions of the subducted continental crust in a caterpillar-like mode would have triggered this, as previously suggested by modelling work.

Keywords: microfabrics, subduction, exhumation, Aegean Sea, $^{40}Ar/^{39}Ar$ geochronology, retrogression