

FIELD FORUM REPORT

Significance of Along-Strike Variations for the 3-D Architecture of Orogens: The Hellenides and Anatolides in the Eastern Mediterranean

16–22 May 2010
Samos, Greece, and Selçuk, West Turkey



CONVENERS

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Twenty geologists from around the world participated in this GSA Field Forum, the aim of which was to explore along-strike variations in the Hellenide-Anatolide orogen, from the eastern Aegean island of Samos to Anatolia. The forum began by exploring a unique section in western Samos where the contact of the Cycladic Blueschist Unit with an underlying Basal Unit is exposed. In the field, Uwe Ring provided an overview of the geologic and tectonic history of the Cycladic blueschists and set forth the goals of the Field Forum. Participants discussed various scenarios for the exhumation of the blueschists and concluded that the contact was likely to be a former large-scale thrust, reactivated as a top-east extensional shear zone in the Miocene. East-west extension in the Hellenide-Anatolide belt is uncommon, because the whole region appears to have undergone mainly N-S extension since the early Miocene. The Basal Unit on Samos is considered part of the External Hellenides and, on Samos, shows evidence for high-pressure metamorphism.

On the second day, participants presented talks and posters on thematic and regional tectonic aspects of along-strike

variations. The topics included large-scale correlations across the central and eastern Mediterranean orogens, differences in lithospheric structure across the Hellenide-Anatolide belt, and various manifestations of along-strike variations from orogens worldwide. This mini-symposium took place in an informal atmosphere, sparking lively discussion.

Participants sailed to western Turkey on the morning of day three and inspected the continuation of the Cycladic Blueschist Unit there in the afternoon. The remaining three days in western Turkey were devoted to exploring in detail the Menderes Nappes (also known as Menderes Massif) of the Anatolide Belt, which form the tectonic footwall below the Cycladic Blueschist Unit in western Turkey. The Menderes Nappes are the main manifestation of the pronounced lateral variations along the Hellenide-Anatolide orogen and are still a focus of major controversy in eastern Mediterranean tectonics. Discussions in the field centered on the following themes: (1) evidence for nappe piling in the Menderes Nappes; (2) timing of nappe stacking and metamorphic events in the Menderes Nappes; (3) how Miocene to Recent extension in west Turkey differ from that on Samos Island and the Aegean Sea region; (4) consequences of along-strike variations on the lithosphere architecture and subduction geodynamics; and (5) the implications of these differences when applied to lithospheric architecture and tectonic evolution in the region.

Participants drew the following main conclusions after examining the Anatolide Belt: (1) the Menderes Nappes represent a Tertiary nappe stack that was assembled under greenschist-facies metamorphism; (2) parts of the Menderes Nappes contain evidence for a late Proterozoic to Cambrian (ca. 550 Ma) orogeny, including eclogite- and upper amphibolite-facies metamorphism; (3) the Menderes Nappes are overlain—with a very pronounced metamorphic break—by the high-pressure metamorphosed Cycladic Blueschist Unit along the large-magnitude Cyclades-Menderes Thrust; (4) Miocene extensional deformation was N-S oriented, and the structural style of extension is very different from that on Samos Island—a pronounced difference was the development of a mid-Miocene erosion surface over much of the Anatolide belt, reflecting the growth of a regional plateau following the first phase of extension there; and (5) overall, the tectonic history of the Anatolide belt shows significant differences compared to that in the adjacent Aegean Sea region.

Forum participants summarized that the observed lateral variations must reflect major differences in lithospheric structure. In the Aegean Sea region, the continued underthrusting of the Adriatic plate in the Tertiary caused pronounced slab rollback and sustained high-pressure metamorphism that affected various tectonic units, including the Cycladic Blueschist Unit and the Basal Unit. In west Turkey, a different lithosphere—that of the Anatolide microcontinent—entered the subduction system. The lithosphere of the Anatolian microcontinent was probably more buoyant and thus resisted subduction to great depth, resulting in a greenschist-facies thrust belt and subsequent development of an orogenic plateau. Rollback in the

Aegean Sea region caused much more N-S extension there compared to western Turkey. It was proposed that this differential extension may have been taken up in the easternmost Aegean and westernmost Turkey by a combination of transcurrent deformation and a large-scale mode-II fracture system responsible for E-W extension on Samos Island. In the late afternoon of the last day, the forum participants had the opportunity to visit the famous ruins in Ephesus near Selçuk.

Participants: Dov Avigad, Whitney Behr, Jamie Buschner, Rubén Díez Fernández, David W. Farris, Klaus Gessner, Bernhard Grasemann, Talip Güngör, Hanan Kisch, José R. Martínez Catalán, Robert B. Miller, Uwe Ring, Matias Sanchez Schneider, Stefan Schmid, Konstantinos Soukis, Nicolas Thébaud, Olivier Vanderhaeghe, Douwe J.J. van Hinsbergen, Francis Wedin, and Olga Zlatkin.

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Rock glacier, northern Colorado. Photo by Marli Bryant Miller, University of Oregon, www.marlimillerphoto.com.