Geophysical Research Abstracts
Vol. 14, EGU2012-10394, 2012
EGU General Assembly 2012

The Eocene Rhodopes

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The Rhodope Mountains in Northern Greece and southern Bulgaria have traditionally been viewed as having a structural position internal of the Vardar suture, hence, above the highest nappes of the Hellenides. Accordingly, their last major orogenic event has been associated with microcontinent accretion to the European margin prior to the closure of the Vardar domain in Upper Cretaceous to Early Cenozoic times. Based on structural and petrological observations and isotopic ages of magmatic and metamorphic events, a different picture of the Rhodopes has emerged over the past years. A large portion of the orogen formed in an Eocene event which included the subduction of continental crust, associated high-pressure metamorphism, exhumation of eclogite-facies basement, large-scale nappe stacking, and subsequent regional extension and magmatism.

The deepest level of the Rhodopian nappe pile, to which we refer as lower Allochthon, comprises greenschist- to amphibolite-facies continental basement with metamorphosed Mesozoic platform carbonates and clastic sediments on top. The heavily deformed and lithologically divers middle Allochthon on top is a mixture of various continental and ophiolitic rocks of different, partly Mesozoic protolith age. It underwent Eocene amphibolite-facies conditions and contains eclogites as well as granitic intrusions all of Eocene age. We propose that at least some of the ophiolites such as the mafic-ultramafic complex at Satovcha represents the suture of the Vardar Ocean as indicated by protolith ages of plagiogranites. Units on top of the middle Allochthon represent the Cenozoic European margin and did not experience high-grade metamorphism in Cenozoic times. However, they do record earlier Mesozoic tectonics and metamorphism up to UHP-metamorphic conditions.

Dramatic Late Eocene extension was associated with the formation of sedimentary basins and metamorphic core complexes and immediately followed by a pronounced pulse of granitic magmatism. The same Late Eocene to Early Oligocene magmatic event is found in Serbia external of the Vardar suture. Like other authors for the situation in Serbia, we attribute extension and magmatism in the Rhodopes to an event of slab rollback and associated upwelling of astenospheric mantle following delamination of continental crust from the downgoing Adriatic slab after closure of the Vardar Domain. In our scheme, the lower Allochthon would represent a window into the high-metamorphic basement of the external Hellenides. Fragments of the floor thrust of the Internal Hellenides (Nestos-Olympos Thrust) below the middle Allochthon have become spread out over a distance of 500 km, measured parallel to the thrusting direction, by rollback-related extension.