



Time markers for ductile deformation in the footwall of detachment faults in the Western Rhodope Complex (SW Bulgaria)

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Metamorphic basement rocks of the Western Rhodope Complex in Bulgaria and Greece belong to a synmetamorphic nappe stack made of continental crust and ophiolites. This nappe stack has been assembled during a long and complex history from Jurassic times to the present. During late and post-collisional stages of the Alpine cycle, extension along low-angle detachment faults led to the exhumation of deep portions of the Rhodopian nappe stack in metamorphic core complexes. Late stages of extension were associated with rift basin formation, volcanism, erosion and sedimentation.

We present a cross section in southwestern Bulgaria through the southern Pirin and western Rhodope Mountains. It runs from Gorno Spanchevo in the West to Dospat in the East and contains the Neogene Strouma Basin as well as the Paleogene Mesta Basin. Both basins are bounded by large-offset normal faults on the eastern side of the basin. Ductile deformation in the footwall shows kinematics according with the detachment fault above, i.e. top-to-the SW shearing. We were interested in to what extent ductile deformation in the footwall of the two detachment faults is associated with these detachments, hence in the age of ductile deformation. In order to do this, we dated the Spanchevo, Teshovo (South Pirin) and Dolno Dryanovo Plutons using LA-SF-ICP-MS U/Pb zircon geochronology at GEUS in Copenhagen.

The Teshovo Pluton, located in the footwall of the Strouma Detachment and also in a lower level of the nappe stack (Pangaion Pirin Complex) is postkinematic with respect to the main foliation in that area and is not in contact with any important fault. The Spanchevo Pluton is pre- to synkinematic and is cut by the Strouma Detachment. The Dolno Dryanovo Pluton in the footwall of the Ribnovo Detachment is synkinematic to the main foliation. Both the Spanchevo and the Dolno Dryanovo Plutons are located in a higher tectonic level than the Teshovo Pluton.

The Teshovo Pluton gives well defined zircon crystallization ages of around 32 Ma. On the other hand single-phased magmatic zircons and magmatic rims from the Spanchevo and Dolno Dryanovo Plutons yield ages of around 56 Ma, whereas inherited cores display ages of around 146 Ma. Variscan zircons, which are typical for the basement of the lower tectonic level, are not present in the Spanchevo and Dolno Dryanovo Plutons. Therefore, we infer that the upper level was not yet placed upon the lower level at 56 Ma. This data support the model that the southwest directed thrusting of the upper level over the lower level took place between 56 and 32 Ma.

The main foliation within basement rocks around the Teshovo Pluton predates the Strouma Detachment. However, ultramylonites immediately beneath the detachment above the pluton appear to be associated with the detachment. The same seems to be the case with basement rocks around the Dolno Dryanovo Pluton, since the Ribnovo Detachment appears to be slightly younger. This is in line with preliminary kinematic observations indicating that shear directions in the immediate vicinity of the Ribnovo Detachment point to a top-to-the SSW-directed shear sense.

Our data supports a Paleogene southwest directed thrusting of the upper level over the Pangaion Pirin Complex (lower level) and is in contrast to other recent studies, which regard subduction and thrusting in this part to be of Upper Jurassic to Lower Cretaceous age. Our study raises the question about the origin of the Pangaion Pirin Complex, since this unit may not represent an independent Mesozoic continental fragment.