

Thermochronological evidence for the Cenozoic exhumation of the eastern parts of the Rhodope Metamorphic Complex, Bulgaria

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We present new fission-track (FT) data (apatite and zircon) to reveal the Cenozoic thermal evolution of rocks from the Lower and Middle Allochthon of the eastern parts of the Rhodope Metamorphic Complex (Byala Reka-Kechros, Luda Reka, Kardzhali, Startsevo and Borovitsa units). The samples were taken from both the hanging wall and the footwall of the major detachments in the area (e.g. Byala Reka and Kardzhali) in order to give evidence for the time of exhumation along each side of these structures. The FT method was applied in the Low-Temperature Thermochronology Laboratory in Bulgaria using LA-ICP-MS technique.

Five samples yielded zircon FT ages between 37.2 ± 3.6 Ma and 29.6 ± 2.7 Ma. The obtained apatite FT ages range between 33.7 ± 1.8 Ma and 22.6 ± 5.9 Ma. The measured horizontal confined mean track lengths of four samples are between 11.7 and 13.7 μm with standard deviation between 1 and 3.32 μm .

The obtained thermal models using HeFTy software reveal two stages of Cenozoic cooling and exhumation. Most of the models give evidence only for a very fast cooling to 60 °C between ~ 36 and ~ 33 Ma related to the exhumation along the main detachments in the area. Some of the thermal models of samples from the Middle Allochthon reveal a second rapid cooling episode to temperature of about 40 °C at 18–17 Ma. This exhumation stage is most probably related to the Miocene activity along the steeper normal faults. The younger apatite and zircon FT ages could be influenced by the volcanic and hydrothermal activity that accompanied the Cenozoic extension or partially reset by the later Miocene extension. The results correlate with the existing thermochronological data for the central and southern parts of the Rhodope Metamorphic Complex (Kounov et al., 2020 and references therein).

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References

Kounov, A., Seward, D., Burg, J.-P., Stockli, D., Wüthrich, E. 2020. Cenozoic thermal evolution of the Central Rhodope Metamorphic Complex (Southern Bulgaria). *International Journal of Earth Sciences*, 109, 1589–1611.