Mezozoic to Cenozoic evolution of southwestern South Carpathians as inferred from fission track geochronology and stratigraphic data

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The Southwestern South Carpathian orogen is composed of various nappe complexes which were assembled during the Cretaceous-Cenozoic orogeny. These are from footwall to hangingwall: (1) the Danubian nappe complex including a Cadomian/Variscan basement; (2) the Arjana and Severin units with Jurassic to Early Cretaceous rift and ocenic sequences; (3) the Getic nappe complex with Variscan continental basement.
Fission track (FT) thermochronology on apatite, zircon and sphene from various units of the South Carpathians, in conjunction with field constrains and previous geochronology enable us to estimate the role of tectonic events responsible for the building of South Carpathian mountain chain as well as to constrain the distribution of various exhumation paths between different regions since Cretaceous.
Zircons from the flysch unit and the Danubian Liassic cover sequences yield FT ages around 200 Ma suggesting cooling of the rift flanks prior to the opening of the Severin rift. Zircon and sphene from the Getic and Danubian basements units, in the klippen region, yield FT ages averaging 110 Ma indicating cooling under 300°C of the basements contemporaneous with, or postdating an Aptian-Albian thrusting phase. During this phase the rift deposits were deformed in an accretionary wedge between Danubian and Getic domains and partially overridden by the Getic crystalline.
Apatite FT ages dispaly a decreasing age trend from the hangingwall (65 Ma) to the footwall units (30 Ma). The age data and corresponding horizontal confined track length distributions suggest that exhumation of the nappe pile occurred in two stages: a) During Late Campanian to possibly Early Maastrichtian, when Severin flysch was emplaced on the top of the „wildflsch" deposits; b) During Late Oligocene to Sarmation when the South Carpathians were thrusted onto the top of the Moesian platform.
Apatite FT ages along major brittle wrench faults indicate reheating above 120°C during fluid flow associated with fault (re)activation during Oligocene and Neogene. Thus shear zone rocks experienced a higher temperature overprint during Cenozoic time than rocks of the unaffected nappe pile. Temperatures of hydrothermal flow along these zones decreased progressively starting with Late Oligocene - Early Miocene when the area began to override the Moesian platform.