Miocene structural inversion of the Adjara-Trialeti back-arc basin as a far-field effect of the Arabia-Eurasia collision

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Young back-arc rift basins, because of the not yet dissipated extensional thermal signature, can be easily inverted following changes in the geodynamic regime and/or far-field stress transmission. Structural inversion of such basins mainly develops through reactivation of normal faults, particularly if the latter are favourably oriented with respect to the direction of stress transfer. The Adjara-Trialeti fold-and-thrust belt of SW Georgia is an example of this mechanism, resulting from the structural inversion of a continental back-arc rift basin developed on the upper plate of the northern Neotethys slab in Paleogene times, behind the Pontides-Lesser Caucasus magmatic arc.

New low-temperature thermochronological data [apatite fission-track (AFT) and (U-Th)/He (AHe) analyses] were obtained from a number of samples, collected across the Adjara-Trialeti belt from the former sedimentary fill of the basin and from syn-rift plutons. AFT central ages range between 46 and 15 Ma, while AHe ages cluster mainly between 10 and 3 Ma. Thermal modelling, integrating AFT and AHe data with independent geological constraints (e.g. depositional/intrusion age, other geochronological data, thermal maturity indicators and stratigraphic relationships), clearly indicates that the Adjara-Trialeti back-arc basin was inverted starting from the late Middle Miocene, at 14-10 Ma. This result is corroborated by many independent geological evidences, found for example in the adjacent Rioni, Kartli and Kura foreland basins and in the eastern Black Sea offshore, which all suggest a Middle-Late Miocene phase of deformation linked with the Adjara-Trialeti FTB building. Adjara-Trialeti structural inversion can be associated with the widespread Middle-to-Late Miocene phase of shortening and exhumation that is recognised from the eastern Pontides to the Lesser Caucasus, the Talysh and the Alborz ranges. This tectonic phase can in turn be interpreted as a far-field effect of the Arabia-Eurasia collision, developed along the Bitlis suture hundreds of kilometres to the south.