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Burial and exhumation history of the Georgian sector of the central Greater Caucasus

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The integration of low-temperature thermochronological and thermal maturity analyses constrains the maximum temperatures experienced during burial by the sedimentary fill of the central sector of the Greater Caucasus basin and the timing of its structural inversion. Raman spectroscopy, illite percentage and stacking order in illite-smectite mixed layers, illite crystallinity index, and Rock-Eval Pyrolysis analyses indicate that the maximum paleotemperatures experienced by the Greater Caucasus basin fill increase progressively from about 100 °C in the southern foothills of the central Greater Caucasus to close to 400 °C approaching the axial zone of the orogen. Apatite fission-track and apatite and zircon (U-Th)/He analyses along the same transect yielded ZHe ages between about 137 and 5 Ma, AFT central ages between about 37 and 4 Ma, and AHe ages between about 10 and 2 Ma, with progressively younger ages approaching the axial zone of the Greater Caucasus. Statistical inverse modelling of thermochronological data, integrating thermal maturity results and all other geological and geochronological constraints available, points to episodic exhumation during structural inversion of the central Greater Caucasus basin. Such basin was first partially inverted in Late Cretaceous/Paleocene times following Northern Neotethys closure along the Sevan-Akera suture zone; renewed basin inversion occurred since Middle-Late Miocene times as a consequence of far-field compressional stress transmission from the Arabia-Eurasia hard collision along the Bitlis-Zagros suture zone. It should be emphasised that this sequence of events applies only to the central portion of the Greater Caucasus and by no means should be extended to the other parts of such a large and complex orogenic system.