

Finding micro-continent in Georgian Caucasus and its implication for crustal evolution

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Georgian Caucasus (Georgia), located in the most northern Caucasus-Iran-Anatolia (CIA) region, covers Greater, Trans- and Lesser Caucasus elevated by the collision between Arabia and Eurasia. Here we present zircon U-Pb ages and Hf isotopes of the Dzirula massif (gabbro to granite) and six Jurassic to Miocene sedimentary rocks from this area. The former magmatic zircons show a main age distribution at ~330-310 along with inherited ages of ~700-500 Ma. The latter detrital zircons display six obviously magmatic episodes in the Phanerozoic including (1) Proterozoic (~1800-1000 Ma), (2) Cambrian to Silurian (~500-420 Ma), (3) Middle Carboniferous (~320 Ma), (4) Late Triassic to Middle Jurassic (~220-170 Ma), (5) Middle Cretaceous (~110-90 Ma) and (6) Middle Eocene (~45 Ma) time. The whole Hf isotopes exhibit large variation of the composition and/or dominant crustal contribution in the scenario before ~320 Ma, and mainly positive-dominant values since ~220 Ma. This observation could be better correlated to those magmatic zircons of the igneous rocks in NE Turkey and NW Iran. These data strongly suggest that the detrital zircons might come from the local erosion of igneous successions in Georgia. Besides, these infer the presence of a relict old continental crust and the injection of a juvenile/depleted-mantle component related to the Arabian-Nubian Shield (ANS) crust forming from the Cambrian to Silurian. This represents that an Arabian-derived micro/ribbon continent has played a significant role on the crustal evolution in this region. Furthermore, the existence of a juvenile crust since the Carboniferous exhibits the extensively growth of the continental crust all over Georgian Caucasus. Therefore, our results could suggest not only the distinctly magmatic events but also crustal development linking to the ANS-involvement, Gondwana separation, Paleo- and Neo-Tethys evolution, Cimmerian orogeny and Arabia-Eurasia continental-continental collision.