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The Great Caucasus – Cavcasioni: Structure and Evolution

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The structure and geological history of the Caucasus are largely determined by its position between the still-converging Eurasian and Africa-Arabian lithospheric plates, within a wide zone of continental collision. The region is divided into several tectonic units, rigid platforms (sub-platform, quasi-platform) and fold-and-thrust belts. Southward of the Scythian platform there occur the following tectonic units: the fold-and-thrust mountain belt of the Cavcasioni, including zones of Fore Range (FR), Main Range (MR) and Southern Slope (SS); the northernmost stipe of the Transcaucasian (TC) forelands.

The Cavcasioni in Georgian, Bolshoy Cavcaz in Russian, Great (Greater) Caucasus in English a northwest-southeast-directed mountain range, represents an intracontinental tectonic system resulting from the Late Cenozoic structural inversion of a Palaeozoic-Mesozoic-Early Cenozoic back-arc basin. Structural relationships of the Cavcasioni with the Transcaucasian massif and Scythian platform are, as a rule, tectonic overthrusts, but in some places the contacts are transitional.

During the Paleozoic-Early Cenozoic, the region belonged to the Tethys – Paleotethys - Prototethys Ocean and its Eurasian margin where there existed a system of island arcs, intra-arc rifts, back-arc basins characteristic of the pre-collisional stage of evolution of the region. Northward migration of the Transcaucasus throughout the Paleozoic caused narrowing of the Prototethys and its transformation into an oceanic back-arc basin. Data for Lower–Middle Palaeozoic palaeo-oceanic thrust sheets of the Paleozoic basement of the Cavcasioni show that the most significant outcrops are located in the Crystalline Core MRZ and in the FRZ. The Dizi (SSZ) basin has developed, at least from Devonian, throughout Palaeozoic and Mesozoic to Early Cenozoic.

During the Oligocene, marine basins were replaced by euxinic type basins, which are considered to represent the beginning of syncollisional development. Beginning in the late Pliocene, coeval with molasse deposition in the foreland basins, subaerial volcanic eruptions occurred, characterized by intensively fractionated magma of suprasubduction-type calc-alkaline series from basalts to rhyolites.

In addition to volcanism, earthquakes indicate active tectonics. Some of the major earthquakes have proven to be devastating; i.e. the Racha earthquake of (April 1991, Ms = 6.9). Seismological data from the southern and middle Caspian Basin, easternmost pre-Caucasus and Cavcasioni reveal a deep seated zone of stress and strain, a zone of the lower crust-upper mantle-earthquake sources. The oceanic-suboceanic lithosphere of the eastern Black Sea and southern Caspian Sea apparently forms resistant domains, around which the main morphological and tectonic structures bend.

The Caucasus region has been considered to be an example of indentation tectonics. The geometry of tectonic deformations in the Caucasus is largely determined by the configuration of the rigid Arabian block intensively indenting into the relatively mobile Caucasian region. Submeridional trough of the lithosphere of the South Caspian Sea may be a structure located at the borderland between the Arabian and Indian plates and resulted from the interference of lithospheric folding.