Geophysical Research Abstracts
Vol. 20, EGU2018-5012, 2018
EGU General Assembly 2018

Tectonics of the Greater Caucasus: from rifting to collision

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The Greater Caucasus (GC) results from the rotational convergence of the Arabian and Eurasian plates. The orogen extends from the Black Sea in the W to the South Caspian Basin to the E. The Tertiary age orogen is the result of the inversion of a former rift basin developed on strongly extended continental crust. The GC forms a doubly vergent orogen with a dominant thrust direction top-to-the south. Both, to the N and the S the orogen exhibits active foreland-fold-and-thrust belts that propagate into their flexural foreland basins. Unlike the GC, extension in the Black Sea and South Caspian basins went beyond rifting to develop new ocean lithosphere, though at different periods. The orogen developed obliquely across the original rift basin/northern rift shoulder setting. Thus, structural domains in the GC, in the Black Sea, and in the South Caspian Sea reflect different former paleogeographic and synsedimentary settings of the southern, central, and northern Greater Caucasus Basin. The main present-day tectonic boundaries (thrusts, strike-slip faults) associated with the plate convergence and the mountain building processes develop along inherited structures.

On the N flank of the Greater Caucasus, in Russia, we observe N-directed thrusting in the foreland fold-and-thrust-belt mainly in Dagestan. In the central and W part steep S-dipping thrusts close to the core of the mountain range indicate N-directed thrusting. Regional monoclinal north-directed dips of the sedimentary series representing the Scythian platform, may be related to basement inversion as seen on reverse thrust in the far foreland, beneath the Stavropol High.
Along profiles from the S-slopes to the core of the orogen we observe a succession of tectonic domains separated by major thrusts and showing fault-related folding. The dominant thrust is the Main Caucasus Thrust (MCT) separating the central GC from the southern slopes, also forming the boundary with Paleozoic basement. Pliensbachian series in the core of the orogen and to the south of the former rift shoulder are heavily intruded with diabase dikes reflecting important synrift stretching. Pillow laves of early Mesozoic age are common in the central parts of the main range, however, no remnants of Mesozoic oceanic crust are known. The GC basin may therefore, be considered a strongly extended rift, but not an ocean with oceanic crust/lithosphere. Thus, the process that led to the inversion of this intracontinental rift basin is a continental collision, but not a subduction s.str. i.e. involving oceanic lithosphere.

The tectonic evolution and the different structural domains will be briefly presented and discussed in the light of new 2D palinspastic reconstructions, new tectonic profiles across the whole mountain range, as well as detailed examples specific geological and structural features, regional tectonic settings, and seismicity.