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Caucasian-Arabian Syntaxis (Alpine-Himalayan convergence zone): an example of continental collision above mantle plume head

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1. The Caucasian-Arabian segment of the huge Cenozoic Alpine-Himalayan collisional belt consists on two domains: the EW-striking Greater Caucasus to the north and the Caucasian-Arabian Syntaxis (CAS) to the south. The CAS includes arc-like tectonic domains of the Lesser Caucasus and Eastern Anatolia and is characterized by a large NS-trending positive isostatic anomaly, which suggests presence of a mantle plume head underneath.
2. The Greater Caucasus in essence represents the southern margin of the Eurasian plate; it is uplifted over the Main Caucasian Fault, which is part of the Kopetdag-Caucasian-TransEuropean Megafault.
3. The Alpine structure of the Caucasus formed by NS horizontal compression generated by interaction of two plates: the Arabian indenter and the East European Craton. In the late Cenozoic, that plate interaction resulted in the transverse shortening of the CAS to 400 km, mainly at the expense of the territory south of the Main Caucasian Fault.
4. The seismic data available do not reveal any subduction zone beneath the Great Caucasus. However, beneath transitional fold and thrust zone between north margin of Arabian plate (Bitlis-Zagros Fault) and the Great Caucasus, two steep north-directed seismic zone occurred which trace up to 50-70 km depth. They look like as possibly peculiar “embryonic” subduction zones, where crustal material involves in descending currents. We suggest that mention above shortening was due to two major causes: (1) the tectonic “diffluence” of crustal material apart from the Arabian indenter, in front of the East European Craton, and (2) involving another part of material in descending flows.
. 5. The CAS includes a Neogene-Quaternary volcanic belt, which is extended from Eastern Anatolia and to the Lesser Caucasus and farther to the Greater Caucasus. The belt is dominated by two types of volcanic rocks: (1) extensive plateau basalts possessing geochemical characteristics of intra-plate (plume-related) rocks, and (2) calc-alkaline and shoshonite-latite volcanic rocks, which are petrologically and geochemically close to those formed in a suprasubduction setting.
6. Geophysical data support an existence of a mantle plume head beneath the CAS and this source of type 1 magmas is clear now. The origin of the type 2 volcanic rocks, most likely, considered with structures, resembling modern “embryonic” subduction zones. So, from geophysical (isostasy and seismicity) and petrological (two types of magmatism) data follow that modern deep-seated structure beneath the CAS is very intricate and represents area of active interaction of plume head with descending currents of crustal material.
7. At present, the processes of deep mantle dynamics are continuing to destroy the pre-Pliocene structure of the collision zone. However, the response of “shallow” tectonics to the deep mantle processes is delayed. Consequently, the mantle plumes are not manifested on the surface, e.g., in form of extensional faulting or rifting.