



Basin closure and growth of a continental collision zone: insights from structural data and balanced cross sections, Georgian Greater Caucasus

Charles Trexler (1), Eric Cowgill (1), Tea Godoladze (2), and Giorgi Boichenko (2)

(1) University of California, Davis, Earth & Planetary Sciences, United States (cctrexler@ucdavis.edu), (2) Ilia State University, Georgia

The Greater Caucasus (GC) Mountains delineate the northern margin of the Tethyan zone in Arabia-Eurasia collision between the Black and Caspian Seas. Structures within the GC accommodate nearly all (70%) of the orogen-perpendicular shortening within this sector of the collision zone, but the structural geometry and tectonic evolution of this range remains poorly constrained, and the total amount of Cenozoic crustal shortening accommodated within the range is widely debated, with estimates ranging from a few tens to multiple hundreds of kilometers. To address this problem, we generated new geologic maps and crustal-scale balanced cross sections along two orogen-perpendicular transects across the western and central GC, based on compilations of our own 1:100,000-scale structural mapping and Soviet-era 1:200,000 geologic maps. On both traverses, the tectonostratigraphy is dominated by fine-grained marine basin sedimentary rocks deposited within the Mesozoic-age Greater Caucasus Basin. The western traverse also exposes a significant volume of volcanoclastic rocks, which is not seen in the central GC.

Our structural data suggest that, broadly, the orogen comprises a south-vergent imbricate stack of north-dipping thrust sheets that root into shallowly north dipping basal thrust beneath the range. The western traverse contains nine ~ 10 km-thick thrust sheets, with a duplex at depth beneath the central GC. The central traverse imbricate stack is made up of 12 ~ 10 km-thick thrust sheets, with increasing dip moving northward across strike of the range becoming sub-vertical in the northernmost thrust sheets. This pattern suggests in-sequence, southward propagation of thrusting within the orogen at this longitude.

Our balanced cross sections indicate a minimum of ~ 180 km of total shortening in the western GC, and a minimum of ~ 240 km of total shortening in the central GC. We consider these to be minimum estimates because we have minimized slip on structures where stratigraphic cutoffs in the hanging wall have been eroded away, and because we have not accounted for possible non-accretionary underthrusting. Our estimates of total shortening are consistent with area-balanced cross sections along the same transects. We posit that the basin(s) in which these sediments were deposited must similarly have been at least ~ 200 km wide prior to initiation of shortening in the Greater Caucasus region.