



Balanced model of a folded structure of Greater Caucasus sedimentary cover and parameters of main faults

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For study of Alpine Greater Caucasus (GC), the 24 detailed structural sections, of total length about 500 km, were used. All profiles were divided into “domains” in which structural parameters were measured. The dip of folds axial surface, an interlimb angle of folds and an inclination of an envelope plain of folds are related to a strain ellipsoid of domain. The reconstruction of a pre-folded state of each domain, including its pre-folded width, was based on modifications of these parameters. Then, 505 reconstructed domains were integrated in 78 “structural cells”. Each “cell” characterizes by a “stratigraphic model” with thickness of sedimentary cover in range $7 \div 18$ km and by a “depth” of the rocks situated in outcrops. GC development model contains three stages: 1) post-sedimentation, pre-folded, 2) post-folded, pre-uplift, 3) the modern, post-uplift of mountains; it was established as ideal sequence of events for a calculations convenience. This method of reconstruction allowed measuring the depths of basement top for three stages, the value of shortening and the amplitude of neotectonic uplift for “cells”.

For NW Caucasus (42 “cells”), values of shortening ($K=L/L_0$) vary from 0.9 to 0.33, average value is 0.65. The width of GC structure here was about 40-50 km (80-100 km at pre-folded state). Depths of the basement top for the first stage (D1) vary from -7 to -18 km (-13.4 in average); for the modern stage depth values (D3) are from -2.2 to -31.7 km (-13.2). The significant deviations of depth of basement top along a section with vertical displacements 5-10 km on faults plains were usual for GC. Amplitudes of uplift and of the erosion (Up) vary from 0 to 22 km (8.9). East half of Greater Caucasus (36 “cells”) was characterized from the North to the South in the Shakhdag and Tfan tectonic zones (SE Caucasus) and the Chiaur zone (Central Caucasus). The common width of GC here was 57 km (20, 10, 27 km for these zones) and its pre-folded width was 111 km (32, 22, 57 km). Shortening values here vary from 0.63 to 0.33 (0.51, 0.45 and 0.43 respectively). The average depths D1 for “cells” in zones were -9.8, -13.4 km (in range $-11.9 \div -16.7$) and -15.3 km; average D3 were -10.2, -12.0 and -20.5 km. The average values of Up were 9.6, 19.2 and 16.1 km respectively (with range $7.2 \div 24.4$).

On the Central Caucasus southern boundary, subvertical Racha Fault has displacement 10-12 km of type “normal fault” on the level of basement top in the balanced model of structure. It means that the lower block (-18 km) of GC basement has the same shortening as in the folded sediments above. The Main Caucasian Fault in SE Caucasus has small (1-3 km) displacement on the level of basement top. The balanced model does not confirm main properties of well-known GC model of accretionary prism type in S.Dotduyev’s version, which has total shortening more than 200-250 km ($K \leq 0.2$) including 50-100 km displacement on each of these faults.