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ABSTRACT VOLUME

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About stability of depth of level of basement top during of a folding formation and mountain building – data of the balanced model of alpine structure of Greater Caucasus

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Alpine structure of Greater Caucasus (GC) was restored in three regions: North-Western Caucasus (NWC), Chiaur zone (on the South in its center) and South-Eastern Caucasus. Detailed structural sections were subdivided in two kinds of objects – “domains” and “structural cells”. Total amount of sections was 24 with common length 510 km, 505 domains have embraced of 2–5 folds each and occupied 0.5–2 km along of section line, 78 structural cells were received by association of 4–8 domains in each. Method of balancing (Yakovlev, 2009) was based on idea of approximation of domain folded deformation by strain ellipsoid. Axial surface of folds, shortening value (fold interlimb angle), and orientation of envelope surface were measured as elements of ellipsoid. Three kinematic operations were used for restoration of each domain: rotation up to horizontal layering, horizontal simple shearing up to vertical position of axial surface and pure shearing (elongation). Segment of section line (actual length and tilting were measured also) was transformed to pre-folded state inside horizontal layering also by the same three operations. Ratio of pre-folded length of aggregated several domains inside “structural cell” to actual length gives shortening value for cell. Pre-folded thickness of sedimentary cover in a cell (about 10–15 km of Liassic–Eocene thin-layered successions) after shortening was increased and some uplift of structure has placed the certain “stratigraphic” level of this new column on the altitude of ground. Using this new thickness, the actual position of top of basement (soil of column) and amplitude of neotectonic uplift were calculated.

The shortening values for structural cells were found for three tectonic zones from North to South in center and East of GC (Yakovlev, 2012; 2015) as 49% in average (with deviations 37÷62%), 55% (36÷67%), 57% (46÷67%). For NWC (Yakovlev, 2009) it was 35% (0÷15÷67%). Existence of significance correlations between six numerical parameters for 78 cells was found; for instance ratio “value of shortening” and "amplitude of a neotectonic uplift" gives R=0.79. Average initial thickness of sedimentary cover (for the end of Eocene) were close to calculated average actual depths of basement top in the same three tectonic zones: -10/-10 km, -13/-12, -15/-21 km (“depth difference”=-6), and -13/-13 km for NWC. Stability of this position was confirmed by dependence of average value of “uplift” from “shortening” for the same regions: +9.64 km/52%, +19.16/55%, +16.0/57%, +8.9 km/35%. For NWC in sequence for eight sections, average values of “depth difference” (Yakovlev, 2015) have small deviation from “0” (0÷ ±3.5 km), but inside sections it may be very large (+2.1/-14.6, +7.5/-11, +5.8/-12.9 km). Reconstruction of structure of GC on the scale of crust with keeping of rock volumes under shortening (50%) up to the depth of 50-100 km in comparison with position of actual Moho showed that replacement of rocks of crust density by rocks of mantle density up to 50-60% of crust volume had to take place (Yakovlev, 2015). The explanation of these data is next: isostasy take very important part in processes of folding formation and mountain building.

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