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# Faults in Paleozoic basement and their participation in Alpine deformation of Greater Caucasus ; evidences from materials of restored (balanced) sections in folded sedimentary cover

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Method. As each fold has information about strain, numerous folds (0.1-1 km width) inside of hinterland (stripe about 1000 x 50 km) of Greater Caucasus (GC) allow to restore structure for whole sedimentary cover. Material of 24 detailed sections of 510 km total actual length in three regions was used for restoration of structure. These sections were split on 505 domains as associations of 2-5 folds. Three parameters of morphology were measured in these domains: dip of axial plain, dip of envelope plain, value of shortening as interlimb angle [1, 2, 3]. Because these parameters correlate with ellipsoid (ellipse) of strain for domain, sequence of three kinematic operations allow to restore actual state of domain to pre-folded state (from ellipse to circle): rotation to horizontal position of envelope plain, horizontal simple shear to vertical axial plain and vertical flattening (pure shear). Aggregation of chain of pre-folded domains is forming a pre-folded state of whole section, and it allows to calculate of shortening value. For correct detailing of strain study, 78 “structural cells” were formed by aggregation of 5-10 domains in each cell. Some additional observations and calculations allow to find initial and post-folded thickness of sedimentary cover, depth of cover bottom, virtual position of cover top (amplitude of erosion) for all tectonic cells. The received result for 78 cells allowed to understand the main features of GC structure, to see a distribution of basement top depth, to give behavior pattern of the basement and to find a role of faults in shortening of the basement and of sedimentary cover.
Results. Three regions of GC were studied: North-Western Caucasus (NWC) [1], Chiaur tectonic zone in South Ossetia (ChZ) and two zones in South-Eastern Caucasus – Tfan Zone (TZ) and Shakhdag zone (ShZ) [3]. The shortening values for structural cells were found as 49% in average for ShZ (with deviations 37÷62%), 55% for TZ (36÷67%), 57% for ChZ (46÷67%) and 35% for NWC (0÷15÷67%). Amplitudes of erosion were calculated as 10 km for ShZ (7÷12), 19 km for TZ (12÷24), 16 km for ChZ (10÷22) and 9 km for NWC (2÷22). Average actual depths of basement top were close to initial thickness of sedimentary cover in the same regions: -10 (-10) km, -13 (-12), -15 (-21) km, -13 (-13) km. However, concrete depth values have high deviation, for instance from -2.2 to -31.7 for NWC and it was correlated often with faults and possible scarps in surface of basement top. Most important result is a detection of subsidence of GC (ChZ) regarding stable block of Trans-Caucasian massif (TCM) to the south from GC. Depths of basement top were found as -8 km of TCM and -19 km of GC. It means that value of shortening of sedimentary cover of ChZ 57% is equal to shortening of basement. Declared in numerous publications, regional detachment and thrusts in GC cannot exist. Several cases of sub-vertical scarps 5-10 km in contour of basement top between adjacent cells were detected in TZ (one in 5 sections), in northern part of ChZ (3 sections), in two cases for NWC. It means also that shortening of basement was accomplished by ductile mechanism mainly. Only first case (TZ) shows possible weak participation of thrust on level of basement top in its shortening.

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