THE METHOD FOR SHORTENING MEASUREMENT IN FOLDS OF CLEAVAGED MULTILAYER AND ITS APPLICATION FOR THE GREATER CAUCASUS NATURAL FOLDS

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Folded and cleavaged flyshoid sequences of alternating argillites, sandstone or limestone are typical for many orogenic belts. Deforming process for more competent layers may be approximate by three mechanisms: buckling, homogeneous shortening and shearing along axial surfaces. These kinematic (geometric) mechanisms have simple descriptions of a layer shape changing by equations. The computer program for fold shape development was compiled. Main features of fold morphology (1) are the fold's flank inclination (Af) relatively axial surface, thickness of the layer (Tf), the angle between cleavage and layer bedding surfaces (Acl) into flank, and thickness of the layer in hinge of fold (Th). The iterations with different shares of these mechanisms give different shape of fold in more competent layer during calculations. The two diagrams for combination of buckling and homogeneous shortening mechanisms were plotted after calculations. Ordinate axes on both diagrams are estimates of flank inclination. First diagram (2) is similar to Ramsay's one and has ratio of thickness in flank and hinge of fold as abscise. The point of estimates shows a fold's position in net of fold shortening (Sh) and a share of buckling in mechanism's combination (Pb, 1.0 equal to ordinate axis).

The abscise on other diagram (3) is angle between cleavage and layering. Main idea of the basis model is that a cleavage origins as perpendicular to bedding and its orientation follows the geometric mechanisms. The point of estimates shows the fold's position on the similar net as on diagram (2). If the fold development coincided with the basis model and only two mechanisms (buckling and homogeneous shortening) were active, positions of fold on two nets are equal. The last diagram (4) permits to evaluate a role of possible shearing mechanism when two positions are not the same on the diagrams (2,3). The lines of fold shape change due to mechanism of shearing along axial surface are drawn for both diagrams (thick lines for 3). Two points (Sh and Pb) from diagram 2 and 3 must be putted on the diagram 3 and two lines must be plotted. The point of these lines' intersection shows estimates of fold shortening and part of buckling.

The method was applied to 36 folds of the Chiaur flysh synclinorium of the Greater Caucasus. For seven sites the shortening estimates were obtained by more reliable method for folds of single viscous layer also.

The differences between estimates were not more than 0.03 - 0.08 Sh and there is no any regular deviation. The average values of shortenings are 0.4-0.5 and ranging from 0.17 to 0.73. These estimates of fold shortening show a good agreement with structures of the synclinorium. High shortening estimates took place near to the Main Caucasus Thrust and around a zone of duplexes in a middle part of the synclinorium.