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"Similar" folds in theory and in nature - the comparison of two models by their application to the study of hinterland folds of Greater Caucasus

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Numerous similar folds are main minor structures in the hinterland. These structures contain the important information about the types and values of deformations of collision zones. The quantitative study of the folds allows us to reconstruct the common structure of these important zones and to make more exact geodynamic models of their formation. We can estimate exactly the deformation values of the folds guided exclusively by correct models of their formation and we can compare natural and model structures using some necessary and sufficient parameters.

The four morphological types of similar folds are proposed to distinguish for deformation studies. The classification bases of these types are mechanical properties of competent and incompetent layers, such as ratio of their thicknesses and ratio of their viscosities. There are: 1) single viscous layer folds, 2) multilayer folds, 3) chevron folds, 4) "counter thrusts" folds. The mechanical final element model of single viscous layer folds [Hudleston, Stephansson, 1973] was used as a common base of the study. The kinematic model of multilayer folds was also used.

The exact calculated geometry of a single layer fold (SVLF) was used for the estimation of the angle between flanks (Af), thickness of the layer on the flank (Tf) and on the hinge (Th), and the length of the flank (Lf). Each model has the value of shortening (Sh) and the ratio of the viscosities of the layer and the matter around (VC, viscosity contrast). The diagrams were constructed which have "Ax" and "Lf/Th" (or "Lf/Tf") axes [Yakovlev, 1978]. The isolines of Sh and CV were the content of the diagrams. Natural folds (73 series) were studied for the Chiaur zone of Greater Caucasus due to measurements of folds geometry. The shortening values were 25% to 82% (56% the average), and the VC values (sandstone/slate) were $\sim 2 \div 15$. The distribution of

Sh values was in reasonable accordance with some different parts of structure of this zone.

The geometrical properties of physical mechanisms (buckling, pure shear and simple shear) were used for the construction of the model of multilayer folds (MLF) [Yakovlev, 2002]. This model also allows the connection of the local strain in the layer with the common strain in the fold. The parameters of the layer geometry, as well as the shortening value (Sh) and the combination of mechanisms (Mc), are the results of PC program calculations. The dip angle of layer on the flank and the ratio Tf/Th were the axes of the plotted diagram, which also contains isolines of Sh and Mc. The geometrical parameters of 36 multilayer folds and chevron folds were measured in the same Chiaur tectonic zone. The shortening values were close to the previous case: $\sim$27% $\div$ 83%. There are 8 local sites, in which the shortening values of both MLF and SVLF were obtained. The high correlation coefficient (0,94) for these Sh values has shown that the kinematic model of the multilayer folds is close to the numerical mechanical model of single viscous layer folds.