

Channels of weak crust in continental collision: where and why

Petr Jeřábek (1), Petra Maierová (2,3), Ondrej Lexa (1), Karel Schulmann (2,3)

(1) Institute of Petrology and Structural Geology, Faculty of Science, Charles University, Prague, Czech Republic

(jerabek1@natur.cuni.cz), (2) Center for Lithospheric Research, Czech Geological Survey, Prague, Czech Republic, (3) EOST, Institute de Physique de Globe, UMR 7516, Université de Strasbourg, Strasbourg, France

Domains of continental collision frequently show development of horizontal channels where weak crustal material is redistributed/transferred along a lateral pressure gradient towards direction of the least resistance. The development of such channels is conditioned by a drop in viscosity allowing the crustal material to flow even at relatively small pressure gradients. Crustal thickening responsible for lateral pressure gradients in orogenic domains along with the temperature dependent rheology of crustal materials may imply that the weak channels form in all thickened domains simply because of thermal relaxation. However, recent geodynamic numerical models focusing on continental collision show more successful results for models with sharp viscosity contrasts across the channel boundaries. In this contribution, we focus on two examples of such channels operating in the lower to middle crust of the moderately thickened Vepor Unit in the West Carpathians (Jeřábek et al. 2012) and in the deep lower crust of orogenic root in the Bohemian Massif (Maierová et al. 2017). In the first case, the development of the channel is associated with mica-rich metapelites occurring in the deep crust. Such anomalous orogenic stratification, inherited from previous Variscan orogenic event, leads to an extreme ductility of the lower crust and its orogen-parallel redistribution. The second case comprise the channel developed in the felsic crustal rocks, which experienced subduction and relamination in the supra-subduction domain. During this process the rocks were transformed into granulites characterized by extremely fine grained mixed matrix of two feldspars allowing to maintain increased ductility over a long time span. These rocks were redistributed away from the subduction zone and occupied most of the orogenic root in the Bohemian Massif.

References:

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