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Exhumation of high grade rocks in Eastern Bohemian Massif: Insight from analogue and numerical modelling

T. Duretz (1), K. Schulmann (2), B.J.P. Kaus (3), and D. Gapais (4)

(1) Dept. of Earth Sci., Geophys. Fluid Dynamics, ETH Zurich, Zurich, Switzerland, (2) Ctr Geochim Surface, UMR 7516, Univ Strasbourg 1, CNRS, Strasbourg, France, (3) Dept. of Earth Sci., Geophys. Fluid Dynamics, ETH Zurich, Zurich, Switzerland, (4) Geosciences Rennes, UMR 6118, Univ Rennes 1, CNRS, Rennes, France

Recent petrological, structural and geochronological studies of the eastern margin of the Bohemian Massif (Czech Republic) suggest a new conceptual geodynamical model to explain exhumation of high grade (20 kbar, 800°C) rocks. This conceptual model involves indentation of a weak orogenic lower crust by adjacent rigid mantle lithosphere, resulting in crustal scale buckling of the weak orogenic lower/middle crust interface followed by extrusion of hot ductile nappes over the rigid promontory. In order to test the hypothesis, we performed both analogue and numerical models. Analogue experiments using a 3 layer sand-silicon setup were carried out in Rennes laboratory (France). Results show that the most important features of the conceptual model can be reproduced providing a sufficient viscosity contrast between the silicones is considered. This involves: periodical buckling of silicones interface, extrusion of lowermost silicon over the indenter and flow of horizontal viscous channel underneath rigid lid above the actively progressing promontory. In addition to the laboratory experiments, we currently perform numerical simulations using the recently developed code MILAMIN_VEP (Kaus, 2008). The first set of numerical experiments are designed to mimic laboratory conditions, i.e. deformation of horizontal layered systems of contrasting viscosities. A second set of experiments are performed on a lithospheric scale, which allows to address the importance of existing temperature variations in Variscan orogenic root systems in terms of temperature dependent rheologies.