Hinsch, Ralph[1]; Schuster, Ralf[2]; Schleder, Zsolt[1]
1

Geometrical kinematical forward modelling of stages in easternmost Alps development

[1]OMV E&P, Österreich;
[2]GeoSphere Austria;
ralph.hinsch@omv.com

Regional balanced cross sections very often represent a visual depiction of the governing processes that led to the finite state. However, for some regional cross sections the deformation processes are poorly understood or constrained. What is the relationship of different tectonic units and how and when were they deformed and brought into contact? Answering such questions often requires an understanding of lithosphere-scale processes and paleogeography at the same time.
Generating crustal scale geometric forward models can be a valuable step to better constrain regional cross sections. In such sections certain geodynamic and mechanical behaviours can be implemented in a simplistic manner (e.g. isostatic movements by flattening the section to an assumed or known sea level). The value of such sections is the consistency over longer periods without showing sudden steps from one evolutionary stage to another. Such sections help in the understanding of geometrical relationships (i.e. contacts between different tectonic units, missing basement etc.). In addition, while constructing such forward sections new questions or solutions evolve that have not been obvious before. The models visualize arrangements over time and help define more specific problems in the regional development that subsequently can be checked by more sophisticated modelling (physical or numerical).
In this session we like to present some attempts of generating forward models illustrating possible kinematics of the alpine collision in the easternmost Alps (Vienna Basin area)., Models are generated iteratively to better match the known constraints. We start our models from a (partly schematic) lithosphere/crustal cross section from Middle/Late Jurassic time. This section features from south to north: 1) an extended margin of Adria (towards Tethys) with the deposition of the Northern Calcareous Alps under the influence of halokinesis, 2) a carbonate platform without halokinesis to the north, 3) an extended Adria margin towards the Penninic ocean, 4) an opening Peninnic ocean and 5) an extended European margin.
We start deforming the cross section from South to North with an oceanic upper plate overriding the extended Tethys margin. Some ideas developed via this process are:

- Allochthonous salt generation at frontal accretion of NCA in front of the obducting oceanic upper plate.
- Switching from frontal accretion to overthrusting of Adria (Lower Austro-Alpine units) related to Jurassic extension towards the north
- We are currently speculating that some uplift/erosion and subsidence signals that the orogen could represent varying crust/lithosphere thickness of the lower plate
- Significant duplexing, back and out-of-sequence thrusting in latest shortening increments (post Gosau).

Although some of the model steps are already relatively complex, they are a rough simplification of the real development. We did not include strike-slip deformation and subduction initiation and we certainly miss deformation events and other constraints. We hope for a discussion enabling to refine the models and our understanding of the regional development. Ideally the discussion will trigger follow-up research which includes looking further into dynamic aspects of some of the proposed events.

Session: *Pangeo workshop: Earth's Spheres (Crust, Mantle & Core)*
Keywords: *Geometrical forward modelling, Eastern Alps, kinematic development, Vienna Basin area*