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3D structural model of the North Alpine Foreland Basin, Bavarian Part

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The continental collision of Europe and Africa leads to the rise of the European Alps, which gave way to the formation of the North Alpine Foreland Basin, also referred to as the Molasse Basin, since the Tertiary. This typically wedge formed “foredeep” basin is filled with predominantly clastic sediments originating from erosional processes of the Alps which overly a southward dipping Mesozoic and Paleozoic succession.

With our project we want to contribute to the understanding of the structure and subsequently of the thermal configuration of the Molasse Basin and its underlying deposits on a basin wide scale. We constructed a 3D structural model of the basin down to the crust-mantle-boundary, beginning with the Bavarian part. Therefore we used an approach of already existing local to midscale 2D and 3D structural models (e.g. Lüschen et al. 2006) as well as surface maps, seismic, well and gravity data. This 3D structural model resolves 5 sedimentary layers of the Mesozoic, including the geothermally utilized carbonate Malm aquifer (e.g. Birner et al. 2011), as well as the combined Paleozoic basement. Assuming isostatic equilibrium of the system a lithosphere-asthenosphere-boundary (LAB) has been calculated and compared to other published LABs of the region. Subsequently the model has been further constrained by 3D gravity modeling.
The outcomes show that Cretaceous sediments are restricted to a small region in the central to eastern model area and are mostly overlain by the Tertiary Molasse sediments. The Triassic sediments occur in the northern and western part of the model area and do not continue far under the Molasse basin proper, while the Jurassic can be tracked as far south as beneath the Alps. The evaluation of the gravity indicates that the crystalline crust consists of a lighter upper crust and a denser lower crust. Our final LAB is shallowest under the Triassic subbasin, descending below the Bohemian Massif and the Molasse Basin proper and rising again under the Alps. Comparing it to recently published LABs (e.g. Legendre et al. 2012) a good match can be noticed concerning the overall depth trend.

References

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