



Seismic reflection data integrated in a combined 3D isostatic and gravity modelling approach – new insights into the lithospheric structure of the northern Upper Rhine Graben and Hessen (Germany)

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Seismic reflection and refraction profiles reveal information on first-order heterogeneities of the crust. After application of a suitable time-to-depth conversion we have re-interpreted near-vertical migrated seismic reflection data of the DEKORP project that image the deep subsurface of the northern Upper Rhine Graben and the federal state of Hessen. The most prominent feature in the crystalline crust, visible in these profiles, is a highly reflective lower crust differentiated from a 'transparent' upper crust showing considerably less continuous reflections.

We present a workflow of integrating the seismic data into a combined 3D isostatic and gravity modelling approach. Basement depth as well as the thickness and lithological variations of the sediment fill are well known in the region. 3D isostatic calculations allow predicting the average density of the sub-sedimentary crystalline crust and thus the thickness distributions of the Upper and the Lower Crust for those parts of the study area where seismic information is missing. Finally, we calculate the 3D gravity response of the entire lithosphere of Hessen and interactively adjust the crustal density configuration to the measured gravity field while keeping the seismic information.

The product of our approach, i.e. a lithospheric-scale observation-constrained 3D structural model, is used to numerically simulate heat transport processes for temperature predictions in this region of high potential for geothermal utilisation.