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Stress and strain modeling of the Central European Basin System

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The present study presents results from 2D numerical models concerning the tectonic evolution of the Central European Basin System (CEBS) in North and Central Europe. The modeling approach is based on the classical thin sheet formulation here implemented for a spherical geometry in order to model large-scale lithospheric stress and deformation fields. Additional 3D steady state conductive finite element temperature and lithospheric strength models for different time slices are carried out in order to provide suitable input parameters and constraints for the numerical simulations.
The study provides insight into the tectonic evolution through time of the main Permian basins and Mesozoic troughs in the system. The obtained results elucidate the relevance of inherited large-scale lithospheric structures in combination with slightly variable stress boundary conditions as derived by several published (palaeo)tectonic plate reconstructions. The complex geological evolution of the different sub-basins reflects the mechanical response of these basins to far-field intraplate stresses which governed the megatectonic setting of Western and Central Europe. On the other hand, inherited crustal and deeper structures inducing processes as strain localization and major deviation of stresses provide first order elements in controlling the evolution of the basin system. The obtained results strongly suggest the close interplay between lithospheric structure and geodynamic forces in controlling basin evolution through time.