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Interaction of long-term tectonic uplift and ice-induced processes in the Central European Basin System: a potential georisk?

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Lithospheric large-scale folding and intracratonic faults and the recognition of the causative activation source play a crucial role in the understanding post-glacial landscape evolution of the North German Basin (NGB). Major basement faults are directed NW-SE, minor faults NE-SW and NNE-SSW (Reicherter et al., 2005). The major tectonic stress field acting within the NGB is induced by the ongoing Alpine collision, and is directed NW-SE to N-S. The NGB was partly affected by glacial loading and unloading of the ice masses. The postglacial drainage pattern and the distribution of lakes in northern Germany follow exactly block boundaries and, hence mark zones of present-day subsidence.

Paleogeographic reconstructions demonstrate that Scandinavia was an area of uplift and, hence, sediment source at least since the Paleogene, and the Pleistocene post-glacial rebound of Fennoscandia cannot account solely for uplift. Consequently, presently two processes of different magnitude and age are interfering: glacio-isostatic uplift and ongoing lithospheric folding. The NGB is presently a subsiding area, where as north of approximately the Danish/German border uplift is recorded. Modeled and calculated fault slips are on the order of 0.08 mm/a for the Hercynian Boundary Fault (Harznordrand-Störung) and 0.02 mm/a. Which would result in 80 cm, respectively 20

cm, of vertical slip during the last 10 ka, since the decay of the ice. This is not enough to produce fault scarps in humid climates (Kaiser et al., 2005). If the influence of the ice cover and the isostatic rebound were neglected, the same faults would provide slip rates 2.30 to 5.20 m in 10 ka. If we calculate uplift and subsidence rates within the NGB and add the observed mean sea level rise in the North Sea (1,1–2,5 mm/a), and include the fault movement rates in several scenarios the coasts and low-lands on both, the North Sea and the Baltic Sea, will be affected severely by flooding in the near-by future.

References

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