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Implication for future coastal changes: the interaction of long-term Alpine tectonic stresses and ice-induced processes in the North German Basin

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Coastline changes are the combined effects of non-eustatic factors of crustal movement, global eustatic sea-level variations and coastal dynamics including sediment transport. Therefore, the sea-level history is always site-specific and is reconstructed by relative sea-level (rsl) curves. Global eustatic sea-level changes are climatically induced. For the near future a significantly accelerated rise of the eustatic sea level is expected (IPCC 2007). With this paper we analyze the non-eustatic factors and their spatial relationships within the NGB (aim 1) and combine these results with different rates of predicted eustatic sea-level rise for the near future to give indications of the position of future coastlines (aim 2). The resulting maps are scenarios as the North German Basin (NGB) is covered by unconsolidated Quaternary sediments and the coastlines therefore are constantly reshaped by coastal dynamics. The coastlines of the southern North Sea and the southern Baltic Sea are within the area of the NGB, which is characterized by subsidence. Paleogeographic reconstructions demonstrate that Scandinavia and the surrounding region were an area of uplift and, hence, a sediment source at least since the Paleogene, and the Pleistocene post-glacial rebound of Fennoscandia cannot account solely for the uplift. Consequently, presently two processes of different magnitude and age are interfering: glacio-isostatic uplift and

ongoing lithospheric compression and folding. Any future changes in the position of the coastlines depend on this pattern. Whereas the absolute rates are measurable (e.g. continues GPS-observations), the long-term (Cenozoic) evolution gives indication of background tectonics and fault activity. As the postglacial rebound is decelerating whereas the Alpine collision is ongoing this tectonic pattern will change in the near future. Therefore the first aim of this study is to analyze the fault-system within the NGB and to quantify the pattern attributed to glacio-isostatic adjustment.