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Interpretation of short-wavelength anomalies in aeromagnetic data from different epochs: a case study in Northern Germany

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Aeromagnetic data from reconnaissance surveys is routinely used for geological mapping and modelling of large-scale, deep-seated structures. In contrast to this, we have evaluated the content of the recently published map of the anomalies of the Earth's magnetic total field in Germany (LIAG, 2010) in the short-wavelength range, that is related to near-surface structures with an extent limited to a few kilometres. The main goal was to examine whether older regional surveys can be used to improve the geometric resolution of local geological units. We have used data acquired by Prakla GmbH (1965-1971) and compared it with a modern, high sensitivity aeromagnetic survey from Sander Geophysics (2005).

Analysis and filtering of both data sets reveal short-wavelength anomalies in the North German Basin, and a notable spatial correlation with subcrops and outcrops of distinct Lower Cretaceous and Jurassic stages. Rock magnetic investigations of field and core samples indicate a weak remanent and induced magnetization (up to 0.15 A/m) in these layers.

We have used these results to modify the structural models of two test sites with different stratigraphies by magnetized layers within the Lower Cretaceous and Jurassic. 3D forward modelling shows that the small-scale anomalies with amplitudes of 10 to 20 nT observed in both data sets can be explained by the introduced layers. In summary, the data from Prakla GmbH contain valuable information down to wavelengths of 2 km, and can be used to stabilize stratigraphic models