

Use of DC and FDEM methods to image the Quaternary aquifer and saltwater at Lüdingworth, Cuxhaven area, Germany

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Summary

Geophysical tools are routinely used to image the subsurface of the earth in support of geological, hydrogeological and environmental investigations. The Lüdingworth area has been studied geophysically in order to investigate the interaction of sedimentary structure and saltwater intrusion. In the area described in this abstract, DC measurements comprised 10 Schlumberger sounding points, two 2D geoelectrical profiles (Wenner beta and combining Wenner beta-Schlumberger) and a 3D imaging. Synthetic modeling was also conducted to interpret the inverted 2D profile and identify limitations of the resistivity technique. It established the resolvability of specific geological features within the glacial sequences. A 3D dipole-dipole complete set technique was carried out in 3D data collection. An FDEM profile was conducted as a fast alternative sounding method to image the glacial sediments and saltwater. The inverted data set results revealed that the subsurface resistivity distribution is highly heterogeneous. A near surface perched saltwater layer, as a result of flooding events, was detected above an interglacial Eemian clay layer. A second saltwater intrusion was imaged at a depth of about 60 m. The average depth and thickness of The Pleistocene aquifer is 20 m and 40 m, respectively.