



Contribution of geophysical data to 3D aquifer modelling: A case study of the Quaternary buried valley Cuxhavener Rinne

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Buried valleys are a common subsurface structure in the glacial affected parts of northern Europe. In Germany, e.g., the Cuxhavener Rinne was generated in Elsterian times below the thick inland ice and extends for roughly 40 km between the cities of Bremerhaven and Cuxhaven. The valley is carved down to 400m depth into the Tertiary layers and refilled with glacial material.

The valley forms an aquifer due to its sandy valley fill. It is in hydraulic contact with the Miocene fine-grained sands beside the Cuxhavener Rinne. The Lauenburger clay covers the valley in parts. Together with younger clay layers it contributes to the protection of the buried valley. A thick clay layer underlies both the Neogene sediments and the buried valley and forms the lower barrier of the aquifer.

For the last years, extensive geophysical research took place across the Cuxhavener Rinne in the scope of the BurVal project. The project focused on groundwater resources of buried valleys as a challenge for geosciences. The geophysical measurements included seismic surveys, the collection of gravity data, ground based and airborne electromagnetic (HEM) and transient-electromagnetic (TEM) measurements as well as borehole logging. The interpreted data is incorporated into a geophysical/geological 3D model of the region.

Great care was taken to model the base of Quaternary which defines the shape of the buried valley. The combination of all data revealed detailed information about its location and the short period changes of its course. Seismic data show a stepwise descending of the flank to the bottom of the valley. The clay beneath the valley is indicated by air-borne TEM data. Together with the gravity data TEM is a strong tool to map the valley and to close the gap between the seismic profiles. The Lauenburger clay appears as good conductor in the HEM and TEM data. Its distribution is supported by drilling and seismic information. The Lauenburger clay is bound to the valley limits and covers most of the deeper infill.