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Geophysical study of a shallow salt diapir in the densely built-up city area of Hamburg, Northern Germany

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The city area of Hamburg is geologically characterised by poorly consolidated sediments at shallow depths and emplacement of salt diapirs. Subrosion and karst may lead to the formation of sinkholes and the development of solution dolines. During the last century, 20 collapse earthquakes took place and so far, more than 30 sinkholes and dolines are known in the metropolitan region. The project aims to gain information on the structure and development of the most prominent salt diapir (Othmarschen-Langenfelde diapir, OLD) with depth ranging from 500 m to zero.

We use, compare and integrate different geophysical data as small scale gravity, passive recordings of ambient seismic noise (ambient vibrations), borehole stratigraphic information, reflection seismics at crossing profiles, small scale surface deformation, hydraulic temperature, salt concentration and hydraulic head.

Gravity, constrained by borehole calibrated reflection seismic profiles, is used mainly to derive a 3D structural model of OLD. The gravity-derived model is compared to H/V derived depth of the salt top impedance contrast.

The model is further compared to anomalies of the deeper fluid system, i.e. the temperature, salt/anhydrite concentration and hydraulic head.

We discuss salt dissolution and salt structure development. The predictions are com-

pared with subsidence patterns at the surface and the existence of faults.