The subsurface of the city of Hamburg (NW Germany) is characterized by sediments related to the ice-sheets from the last three major glaciations (i.e. Elsterian, Saalian and Weichselian). During the Elsterian (0.465 – 0.418 Ma BP), up to 350 meter deep incisions were formed which are usually referred to as tunnel valleys. Studies from the Southern North Sea show that these kind of valleys can be up to 100 km long. The valley walls are often steep with more than 15 degrees, the valley base is undulated. Furthermore, the beginning and termination of the valleys is often abrupt. All these observations seem to indicate that tunnel valleys were formed by subglacial erosion associated with overpressured meltwater (Huuse & Lykke-Anderssen, 2000).

Spatial distribution of tunnel valleys is most probable related to the substratum coinciding with the middle valley through where most of the meltwater flows (Sirocko, 2002). In NW Europe that is mainly influenced by the distribution of salt diapirs. The architecture of Tertiary sediments and deep tectonics may also play an important role.

To investigate the tunnel valley complexes in the Hamburg area, approximately 16.000 boreholes with a length of more than 20 meter were used. Borehole descriptions contain information on the stratigraphy/age, assumed genesis, lithology and colour. Some 2D seismic lines were available as well in order to constrain lateral continuity of the valleys themselves and the sedimentary bodies within them. The borehole and seismic data is also used to constrain the architecture of the Tertiary layers in which the valleys were incised.

Commercial, 3D geological modelling software is used to visualize the large number of boreholes and to build a comprehensive and detailed stratigraphic framework of the glaciogenic sediments as well as the layers predating the glaciation. Some geostatistic algorithms then allow to interpolate the properties of interest between the boreholes. The power of this approach lies in the ability to interpret and visualize the immense dataset from the Hamburg area semi-automatically. It also allows for testing quickly and easily different hypotheses on subsurface architecture.

The results of this modelling effort will enhance the knowledge of depositional and erosional processes, spatial distribution, internal architecture and relation to other glaciogenic deposits such as outwash fans and eskers.

Understanding tunnel valleys is important as these often represent valuable aquifers in NW Europe and North America and comparable facies from Ordovician and Carboniferous age constitute hydrocarbon reservoirs in North Africa and the Middle East.

**Literature**
