Subsurface modeling and geo-archaeological mapping of the Zeebrugge area

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In the framework of the Complex Project Kustvisie (formerly known as 'Vlaamse Baaien') a pilot study is currently performed focusing on the accessibility of the harbour of Zeebrugge. The latter requires sound knowledge of the local geology. Old studies suggest the presence of a large buried palaeovalley and sandstone layers, which may cause stability and/or structural problems. At the same time, the large amount of fossil bones found offshore Zeebrugge indicates an archaeological 'hotspot'. The aim of the present study therefore is twofold: (1) obtain a detailed model of the subsurface, and (2) map the palaeolandscape evolution and archaeological potential of the area.

In a first phase a dense network of very high frequency acoustic (seismic) subbottom measurements was carried out (winter 2016–2017). Due to the widespread presence of shallow gas in the area the acoustic data only provided limited information. During a second phase, a series of cone penetration tests (CPT) and cores of up to 30 m deep were taken in the summer of 2018 (in total 26 CPTs, 9 continuous cores, 9 discontinuous cores). The continuous cores were photographed and described in detail, and sampled for a wide range of environmental analyses (a.o. pollen, diatoms, shells, C14, OSL). The discontinuous cores were sampled every 0.5 or 1 m for lithological and geotechnical analysis.

The newly obtained seismic, CPT and core data were integrated with (often very old) existing data, both offshore and onshore. This resulted in a (preliminary) 3D layer model of the wider Zeebrugge area, focusing not only on the Quaternary deposits but also on the Paleogene layers. In addition, a 3D voxel model was made with a voxel size of 50x50x0.5m. Where possible the voxels also contain geotechnical information (in addition to the lithology). Environmental analysis is currently still under way; the palaeolandscape and geoarchaeological maps will likely be available in the summer/fall of 2019.

Keywords: Subsurface model; Voxel model; Palaeolandscape; Zeebrugge