

Cone Penetrating Testing to map deeply buried palaeolandscapes for geo-archaeological prospection of polder areas

Tine MISSIAEN^{1,*}, Katrien HEIRMAN^{1,†}, Jeroen VERHEGGE²

¹ Ghent University, Renard Centre of Marine Geology, Department of Geology and Soil Science, Krijgslaan 281/S8 9000, Ghent, BELGIUM

² Ghent University, Department of Archaeology, Sint-Pietersnieuwstraat 35, 9000 Ghent, BELGIUM

[†] Currently at the Danish Geological Survey, Ø. Voldgade 10, DK-1350 Copenhagen, DENMARK

*Corresponding author: tine.missiaen@ugent.be, +32 (0) 9 2644571

Keywords: CPT, palaeolandscape mapping, archaeology, prehistoric wetlands

Abstract

Geoarchaeological mapping of wetlands conventionally involves extensive coring. Especially in wetlands marked by a deep palaeosurface (> 3 m deep) this can be very difficult and time-consuming. We present an alternative approach based on Cone Penetration Testing (CPT) for structured, rapid and cost-effective evaluation of buried palaeolandscapes. Both estuarine environments (Doelpolder Noord) and river floodplain environments (Kerkhove) were investigated, including the water-land transition zone (marsh). The efficiency, reliability and repeatability of the CPT method was tested through the comparison with ground-truth core data and geophysical data. The CPT data generally allowed highly accurate mapping of the palaeotopography of the prehistoric surfaces and the overlying peat sequences. The use of a lightweight, mobile rig allowed to obtain CPT data on the tidal marsh. Also here the buried palaeosurface and peat surface(s) were clearly identified. Thin organic-rich clay intercalations within the peat layers could often still be identified. However it was difficult to distinguish between recent estuarine sand and clay deposits. Additional pore pressure and conductivity data (from CPT-U and CPT-C) did not add much crucial information and their main use seems to lie in the added value for near surface geophysical measurements. Velocity information obtained from simple seismic CPT measurements showed a good correlation with the CPT logs and nearby cores. However to obtain a high accuracy and resolution this method requires much time, which seriously affects the cost-efficiency. A major disadvantage of CPTs is that they do not provide information about possible erosion, truncation and/or bioturbation of sediment levels. Conventional coring will therefore still be needed, but the palaeotopographical and lithostratigraphic information obtained from CPT data will allow a much more efficient coring and sampling strategy in the view of geo-archaeological landscape mapping.