Reconstructing the submerged middle and late Pleistocene paleolandscapes on the outer Belgian continental shelf

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During the Pleistocene (2.58 million to 11.7 thousand years ago), the earth experienced cycles of glacial periods during which extensive ice sheets covered large parts of North America and Europe, and interglacial periods with a climate similar to the current conditions. The vast amounts of water trapped in the ice sheets during glaciations resulted in a global sea level up to 130m lower than present, exposing much of the North Sea for long periods. The now submerged continental shelf between mainland Europe, the UK and Scandinavia featured diverse terrestrial biomes, extensive continuations of European river valleys and advancing and retreating ice sheets which affected the fauna, flora as well as human occupation. Furthermore, the British and Scandinavian Ice Sheets coalesced over the northern North Sea during the last 3 glacial periods, blocking the drainage of European rivers and establishing proglacial lakes at their southern margins. The outflow of these lakes occurred southwards via the Axial Channel, establishing the Strait of Dover by eroding a former land bridge connecting the UK with mainland Europe [1].

The Belgian Continental Shelf (BCS) holds an important position in the southern North Sea. Rivers such as the Scheldt, IJzer and potentially the Rhine-Meuse system are thought to have drained into this Axial Channel at the edge of the BCS during periods of low sea level, before flowing southwards into the Atlantic via the Dover Strait. On top of that, sedimentary evidence of the transgressions at the onsets of the last 2 interglacials can be found[2][3]. However, the Quaternary sediment cover is often patchy and incomplete as there is limited accommodation space to preserve sediments on the BCS. On top of that, a significant amount of the deposited sediments are eroded during the transgressional phases.

In recent years, new and higher-resolution seismic and acoustic data have been recorded for scientific and commercial purposes in the more offshore sections of the BCS, an area where data availability was previously scarce. These data suggest that more Pleistocene sediments may have been preserved than previously thought. For example, a paleovalley situated below the Fairy Bank that was only barely noticeable before[3] is now clearly imaged, and the extent and complexity of sheet-like deposits situated in the more offshore parts of the BCS can now be mapped.

In this project, the new geophysical data will first be used to map the lower boundary of the Quaternary deposits in unprecedented detail. This surface is formed by multiple phases of erosion, and its morphology provides valuable information about past river valleys and transgressional erosion. Then, the extent and thickness of the overlying (potential) Pleistocene depositional units on the outer BCS will be examined. Based on these results, precisely targeted vibrocores will be obtained in order to characterize the sediments. Detailed analyses of microfossil or pollen assemblages are planned to derive the depositional environment and age of deposition. Combining this information with earlier research conducted on the more nearshore zone of the BCS and wider Southern North Sea will eventually allow to establish a comprehensive, updated reconstruction of the paleogeographic evolution of the BCS.

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[2] Mathys, M., 2009. The Quaternary geological evolution of the Belgian Continental Shelf, southern North Sea, PhD thesis, Ghent University, Belgium.

[3] De Clercq, M. 2018. Drowned landscapes of the Belgian Continental Shelf: implications for northwest European landscape evolution and preservation potential for submerged heritage. PhD thesis, Ghent University, Belgium.

Keywords
Paleolandscape Reconstruction; Seismic Stratigraphy; Belgian Continental Shelf; Pleistocene