Searching for seismic and sedimentary evidence for proglacial lakes during the last glaciation: first observations in the areas south of Dogger Bank and Oyster Ground (southern North Sea)

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The southern North Sea is characterized by a complex and long geological history. During the Quaternary, the area was affected by increased climatic instability that led to regional sea level oscillations and extensive glacial-interglacial cycles[1,2]. In the past 500,000 years, the region has witnessed three major glacial phases, referred to as the Elsterian (MIS 12), the Saalian (MIS 10-6), and the Weichselian (MIS 4-2) glaciations. Former studies proposed that large proglacial lakes must have developed close to the ice margins during each of these glacial periods due to glacial meltwater and the drainage of numerous northern European rivers[3,4]. Focusing on the last glacial-interglacial cycle, the sea-level record illustrates a period of a rising sea level towards the last interglacial period, the Eemian (MIS 5e), reaching values close to the present, followed by a drop of 40-50 m during the last glacial period, the early Weichselian (MIS 4). These climatic changes contributed to the periodic erosion and infill of the southern North Sea, the record of which is preserved in the offshore deposits.

This study is focused on mapping the geomorphological features and finding sedimentary evidence for the occurrence and exact location of the proglacial lakes during the last glacial cycle. In the southern North Sea, glaciolacustrine sediments and sedimentary remnants of a small proglacial lake (750 km²) have been identified on Dogger Bank[5,6] but no other convincing sedimentological and geomorphological evidence of the presence of a large regional-scale proglacial lake has been identified yet. Based on the theoretical locations of this lake and the projected maximum extent of the last ice sheet, we focused our research on the areas south of Dogger Bank and Oyster Ground[7,8]. Our methodology includes analysis and interpretation of high-resolution seismic reflection data and sediment cores, data collected through the WALDO project offshore campaigns in 2022 and 2023. The WALDO ("Where are All the (proglacial) Lake seDiments in the NOrth Sea Basin?") project, funded by BELSPO has the goal of examining the hypothesis that proglacial lakes existed in the southern North Sea during the Middle and Late Pleistocene glaciations.

Preliminary results in the areas south of Dogger Bank and Oyster Ground depict stratigraphic and geomorphic indicators that point to a complex and dynamic environment during the last glacial cycle. Through the examination of the newly acquired data, we hope to provide new insights into the glacial landscape evolution of the southern North Sea and provide regional palaeo-environmental and palaeo-geographic reconstructions during the last glaciation.

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Keywords
North Sea; Quaternary; Seismic Stratigraphy; Weichselian Glaciation