

Microfossils of Testerep: Foraminifera, radiocarbon anomalies, and sedimentary enigmas

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The aim of the multidisciplinary Testerep project is to capture the evolution of the Flemish coastal landscape over the past 5000 years. The Testerep peninsula was once located on the Flemish middle coastal plain, between Ostend and Westend. During the Medieval period, the landward side of this peninsula was transformed into a polder landscape, while the seaward side, including the medieval city of Ostend, was swallowed by the sea. This project specifically aims to understand the past impacts and interplay of natural changes (e.g. sea-level rise) and human interventions (e.g. construction of dikes) on the evolving morphodynamics of this stretch of the coast.

In the framework of this study, micropaleontological specimens, specifically two mixed benthic foraminifera samples, were obtained from offshore sediment cores for the purpose of radiocarbon dating and paleoenvironmental analyses. However, both foraminifera radiocarbon dates gave unexpectedly old ages.

More specifically, the first sample yielded an age of approximately 7.4 thousand years before present (ka BP); however, the surrounding sediment was dated with the use of Optically Stimulated Luminescence (OSL) to c. 930 BP. The second sample was dated to c. 35 ka BP, which is noteworthy as the marine environment necessary for these foraminifera was absent in the region during this period. This discrepancy does not appear in radiocarbon dates derived from shells; these do correspond to the OSL dates within the same core. However, there are at present no radiocarbon dates from both foraminifera and shells from the same core or a similar unit.

We speculate that the foraminifera in the latter (older) sample represent a combination of reworked Pleistocene and more recent Holocene specimens. The apparent freshness of these reworked foraminifera suggests rapid deposition and short transport from a unit in relative proximity. The Pleistocene foraminifera are suspected to originate from the Last Interglacial deposits (117-130 ka BP), which have been reported near Ostend. This period also marked the last time the area represented a marine environment before c. 7.5 ka BP. If our hypothesis is correct, then it is likely that the former (c. 7.4 ka BP) sample may have been subject to the same reworking processes, hence resulting in older-than-expected radiocarbon ages.

This study underscores the necessity to apply caution in using foraminifera for radiocarbon dating. Furthermore, it poses important questions on the use of such samples for paleoenvironmental reconstructions in coastal settings. This outcome shows the importance of the use of a multi-proxy approach when reconstructing past dynamic coastal environments.

To address this issue, we propose to do a more detailed study comparing shell material versus foraminifera samples from single units.

Keywords

Testerep; Foraminifera; Micropaleontology; Carbon-14; Sedimentology; Paleoenvironmental-reconstructions