Analysis of natural and human-induced climate changes over the past 14,000 years in the Norwegian Trench

Multi-proxy approach to gain valuable insights into natural variability in bottom water temperatures, changes in ice volume, source of organic matter and $CaCO_3$ content to assess recent global warming in the North Sea-Atlantic system.

Department: Earth Sciences
Research group: Marine Palynology & Paleoceanography
Supervisor: Cecile Hilgen, Francesca Sangiorgi
Email address: c.s.hilgen@uu.nl; f.sangiorgi@uu.nl

Project description

The Norwegian Trench serves as a crucial passage connecting the Baltic and North Seas to the Atlantic Ocean, shaping the properties of the water outflow into the global ocean circulation. We have visited this area the past two years with the research vessel RV Pelagia. Sediment cores were obtained and analysed using X-ray Fluorescence (XRF) core scanning. For one 7-meter core, chronology was established using radiocarbon dating points, revealing a maximum age of 14,000 years. The aim is to investigate the natural and anthropogenic drivers of primary productivity and carbon burial in the North Sea-Atlantic system throughout this period. The XRF data, together with low-resolution $\delta^{18}O$ measurements, suggest that marine productivity and carbon burial in the Norwegian Trench were significantly influenced by natural and anthropogenic key events such as gradual sea-level transgression after the last glacial maximum and the onset of deforestation and agricultural activities. In order to investigate these events in further detail and how they are related to the AMOC (Atlantic Meridional Overturning Circulation) and NAO (North Atlantic Oscillation), for example, we are looking for a student who can help perform high-resolution analyses on our sediment cores. The main objective of this subproject is to determine the source of the organic carbon in the sediment, bottom water temperatures and ice volume changes and the calcium carbonate content.

One of the tasks of the student is to perform oxygen isotope measurements on planktonic and benthic foraminifera from multi-cores and piston core samples that span the Norwegian Trench from south to north. For this purpose, the sediment will be sieved, and the foraminifera will be picked under the microscope. Other tasks will include $CaCO_3$ measurements, picking one species of dinoflagellate cyst for carbon isotope analysis or bulk isotope measurements. This will be done in consultation with the student. Are you interested in investigating the changes in the Earth's system when humans first appeared in northwestern Europe and identifying the chemical and biological signatures of past climate conditions in sediment cores? Apply now to be part of this research!

Job requirements

The ideal candidate has an affinity for working in a laboratory and with a microscope. Interested in the marine carbon cycle and proxy data is a plus! Proficiency in identification of foraminifera and experience measuring oxygen isotope signals is not a requirement.

During this assistantship, the student will work in the palynology lab, which includes training in sample processing. Depending on the species of foraminifera present in the samples, the student will be trained in identifying specific species and collecting them to measure $\delta^{18}O$.