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Reconstructing pre-impact baseline conditions using benthic foraminifera in an area of increasing petroleum exploration activities

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While macrofauna is traditionally used to bio-monitor to state of the ecosystem, benthic foraminifera have large potential for bio-monitoring as well. As their tests stay preserved in the sedimentary archive it is possible to reconstruct pre-impacted conditions, by studying foraminiferal assemblages in sediment cores. The use of foraminiferal faunas as bio-monitoring tools is complicated by the natural variability. Therefore, detailed site specific studies are needed, to understand the range of natural variability of the area of interest.
This study characterizes the natural variability in the Bjørnøyrenna-Ingøydjupet area in the Southern Barents Sea. The Southern Barents Sea is a relatively un-impacted and uncontaminated area, however petroleum industry related activities are expected to increase in the near future. This makes the area a valuable natural laboratory to establish pre-impacted baselines for future seabed monitoring programs. Benthic foraminiferal assemblages were examined at high resolution in sediment cores and compared to sediment properties and metal concentrations.
Species associated to temperate water masses dominate in the southern part of the study area, while species associated to cooler water masses increase in abundance towards the north into Bjørnøyrenna. Additionally, the foraminiferal assemblages might reflect climatic oscillations on both millennial and decadal time scales.
Patterns in the calcareous foraminiferal assemblages suggest an enhanced food supply as a result of increased Atlantic Water inflow through the region during the last 150 years. Sediment TOC content has been linked with variable inflow of Atlantic Water. A strong positive correlation was observed between TOC content with metal content in the cores. It is therefore essential to consider the role of natural variability of oceanographic conditions when using benthic foraminiferal assemblages to monitor for potential anthropogenic impacts on the environment.
This study serves as an important baseline data set prior to increasing industrial activities in the Southern Barents Sea. This information supports the application of foraminiferal assemblages as a bio-monitoring tool applicable in high latitudes.