Międzynarodowa Środowiskowa Szkoła Doktorska
przy Centrum Studiów Polarnych
w Uniwersytecie Śląskim w Katowicach

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Title of PhD project: A Multi-Proxy Assessment of Arctic Atlantification and Its Impact on the Marine Environment During the Holocene

The leading unit: Institute of Oceanology, Polish Academy of Sciences (IO PAN), Sopot, Poland

Requirements:

1. Master's degree in oceanography, Earth sciences, environmental sciences, or a related discipline.
2. Experience in laboratory work (e.g., foraminiferal analysis, geochemical techniques).
3. Experience in writing scientific manuscripts will be considered an asset.
4. High proficiency in English, both written and spoken.
5. The application should clearly demonstrate how the candidate's background and experience will contribute to the successful implementation of the PhD project.

Tasks description:

1. Preparation of marine sediment samples for geochemical and foraminiferal analysis.
2. Taxonomic identification of planktonic and benthic foraminifera.
3. Preparation of foraminiferal specimens for stable isotope analysis.
4. Radiocarbon dating of sediment samples.
5. Grain size analysis of sediments.
6. Construction of sediment age models.
7. Foraminiferal shell analysis using SEM-EDS techniques.
8. Presentation of research results at international conferences and publication of findings in peer-reviewed scientific journals.
9. Preparation of project progress reports.
10. Assistance in the team's routine scientific activities and maintenance of laboratory equipment.
11. Participation in scientific cruises to the North Atlantic region.

Summary of a doctoral project:

One of the consequences of global warming is the poleward migration of thermophilic plant and animal species, driven by the increasing influx of Atlantic water masses into polar

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regions. This so-called "Atlantification" process has accelerated in recent years, reshaping Arctic ecosystems on an unprecedented scale.

However, Atlantification is not a new phenomenon. Geological records from marine sediment cores indicate that similar changes occurred during the warmest intervals of the Holocene—the interglacial period that has lasted for over 12,000 years. With this in mind, we aim to investigate how past environmental changes have influenced Arctic foraminiferal communities.

Foraminifera are among the most abundant and widespread unicellular marine organisms, playing a critical role in scientific research. Due to their short life cycles and rapid response to environmental changes, they serve as valuable indicators of Atlantification. Additionally, foraminifera contribute significantly to the burial of inorganic carbon in glacial sediments, thereby aiding in long-term carbon sequestration in marine ecosystems. Understanding how Arctic foraminiferal communities may evolve is thus of global relevance, particularly since some species are more efficient at carbon sequestration than others.

Our research will involve the analysis of several marine sediment cores. By applying a combination of radiocarbon dating and tephrochronology (the identification of volcanic ash layers), we will be able to trace the migration of thermophilic foraminiferal species into the Arctic with high chronological precision. The study will focus on periods known to have been warmer than today. A comprehensive research framework—including micropaleontological, sedimentological, geochemical, and biomarker analyses—will enable us to reconstruct past environmental conditions in detail. We will characterize and compare foraminiferal communities using statistical methods and calculate the degree of similarity between different assemblages.

Other information:

The work will be carried out under supervision of: prof. Marek Zajączkowski, trapper@iopan.pl, Instytut Oceanologii PAN, promotor główny; dr Magdalena Łącka-Wojciechowska, mlacka@iopan.pl, Instytut Oceanologii PAN, promotor pomocniczy

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