



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

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41-200 Sosnowiec
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No. of PhD project: IEDS/2022/IGF/B

Title of PhD project: *Quantifying temporal and spatial variability of glacier calving in Hornsund fjord, Spitsbergen*

The leading unit: Institute of Geophysics, Polish Academy of Sciences (IGF PAN), Warsaw

Requirements:

1. The candidate should have a Master of Science Degree or equivalent qualification in physics, geophysics, oceanography or related. The recruitment committee will consider applications sent by candidates that are able to submit the copy of master's diploma by August 1, 2022.
2. Interest in glaciology and marine research.
3. Knowledge in using tools for data analysis, with strong emphasis on programming skills (e.g., Matlab, Python, C) and spatial analysis (GIS).
4. Capability of using mathematical apparatus in science.
5. Fluent English enabling (i) communication with international partners, (ii) presentation of results during conferences, (iii) literature studies and (iv) scientific writing.
6. Ability to work independently and in a team.
7. Creativity and the ability to think critically and analytically.
8. Willingness to build and develop a research network, and to maintain relationships with project partners and researchers from various research institutions.

Favorable qualities of the candidate:

9. Confirmation of the acquired knowledge in the field of physical oceanography and/or glaciology through previous achievements: diploma theses, scientific publications, conference presentations and participation in research projects.
10. Experience in research or tourist activity related to the marine environment (e.g., motor boat handling, sailing, diving).
11. Experience in the analysis of photogrammetric and/or acoustic data.

Tasks description:

1. Analysis and interpretation of data, including acoustic recordings, time-lapse and satellite images, measurements of water temperature and salinity (CTD profiles).
2. Co-organization and conducting research in Hornsund fjord, Spitsbergen.
3. Preparation of scientific articles and promotional materials.
4. Presentation of research results during national and international conferences.



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5. Expanding knowledge in the field of research through literary studies and participation in workshops and/or summer schools.
6. Preparation of project proposals.
7. Active participation in scientific cooperation at the national and international level.
8. Assistance in everyday tasks of the Polar and Marine Research Department, including support in the care of measuring equipment.

Abstract:

The PhD will be conducted under the research project *“Studying glacier calving fluxes and calving styles through a novel combination of acoustic and optical methods”*, funded by the Polish National Science Centre and led by dr. Oskar Głowacki.

The project answers the growing need for better understanding and monitoring of the reaction of marine-terminating glaciers to climate shifts. The rise of sea level caused by melting ice may soon force the displacement of roughly 200 million people living in coastal areas. The rapid release of glacier meltwater also impacts the global heat transfer and the circulation of critical nutrients in the ocean. That is why it is so important to study the retreat of glaciers in two ways: through short-term experiments and long-term monitoring.

Making any measurements in remote glacial bays is difficult and dangerous. Building-size ice blocks that break off from glacier termini in a process known as *'calving'* pose a significant threat to researchers. Therefore, it is necessary to keep a safe distance when making measurements. Unfortunately, satellite remote sensing is usually insufficient for monitoring glacier mass loss. Glaciers move towards the sea like rivers of ice – the speed of the glacier movement must be taken into account when monitoring changes in the position of the ice cliff. Satellite images are usually taken every few days or less frequently and therefore do not allow for observing individual calving events and providing accurate estimates of the glacier surface velocity. Moreover, taking high-quality images of glacier termini during the polar night or overcast skies is usually impossible. Consequently, the development and application of new techniques for both studying and monitoring marine-terminating glaciers are critical.

The project will use innovative methods of recording and analyzing glacier sounds. Recent studies have demonstrated that the glacier mass loss due to calving can be measured using the underwater noise generated as icebergs impact the sea surface. Using this knowledge and supporting acoustic methods with modern optical techniques and oceanographic measurements, the project aims to answer two major questions:

1. What is the impact of distinct calving mechanisms on the glacier mass loss under different environmental conditions?



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2. Can we use passive acoustics combined with optical remote sensing as a key for efficient monitoring of glacier mass loss due to calving?

The implementation of the doctoral dissertation will make a significant contribution to answering these questions by analysing the spatial and temporal variability of the glacier calving processes in Hornsund fjord. Different kinds of variation will be considered: seasonal, inter-annual, along glacial termini, and between the selected glaciers (Hansbreen, Muhlbacherbreen i Paierlbreen). The successful candidate will analyse archival and newly collected acoustic, oceanographic, photogrammetric, and other data. The PhD student will collaborate with international partners from Scripps Institution of Oceanography, University of California San Diego (USA) and National University of Singapore under the International Partnership for the Acoustic Monitoring of Glaciers (IPA OMG).

Other information:

The work will be carried out under supervision of: Assoc. Prof. Mateusz Moskalik, e-mail: mmosk@igf.edu.pl, and Dr. Oskar Głowacki, e-mail: oglowacki@igf.edu.pl, Institute of Geophysics of the Polish Academy of Sciences in Warsaw, as part of the NCN SONATA research project nr 2021/43/D/ST10/00616: *“Studying glacier calving fluxes and calving styles through a novel combination of acoustic and optical methods”*.

Secretary of the IEDS Recruitment Committee: +48 32 3689 380, e-mail: polarknow@us.edu.pl

Information on the IEDS admissions: https://www.mssd.us.edu.pl/en/admission_2022_2023