



**Centre  
for Polar  
Studies**

Centre for Polar Studies  
ul. Będzińska 60  
41-200 Sosnowiec  
POLAND  
polarknow@us.edu.pl



**PhD student position at environmental Interdisciplinary Polar Studies**

**in Centre for Polar Studies, Leading National Scientific Centre (KNOW)**

**Reference No: CSP/2015/IO/3**

**Title of PhD project:**

Interactions between large-scale atmospheric and oceanic processes and local hydrographic conditions in selected arctic fjords

**Location:** Centre for Polar Studies/ Institute of Oceanology, PAS

**Deadline:** 15<sup>th</sup> August 2015 r.

**Interviews:** 10<sup>th</sup> – 13<sup>th</sup> September 2015, venue will be indicated later

([http://www.polarknow.us.edu.pl/wp-content/uploads/Location\\_CPS\\_partners.pdf](http://www.polarknow.us.edu.pl/wp-content/uploads/Location_CPS_partners.pdf))

In the case of students from abroad the interview will be performed in the form of video conferencing.

**Mode of study:** full-time

**Degree to be obtained:** Doctor of Philosophy in Earth Sciences, discipline – Oceanology

**Duration:** 4 years (8 semesters), from October 2015

**Language:** Polish and English, Polish is not obligatory for students from abroad

**Scholarship:** citizens of Poland, EU citizens and owners of Card of the Pole can apply for scholarships funded by the KNOW (Leading National Scientific Centre) 2 000 – 4000 PLN/month (paid no longer than during four academic years)

**Fees applicable:** EU citizens applying on a regular basis – no fees; Non-EU citizens: 3 000 EUR per year; More information are available on website <http://admission.us.edu.pl/english/admission-rules>

**Required documents and registration online:**

[http://www.polarknow.us.edu.pl/en/isp\\_eng/required-documents-and-registration-online/](http://www.polarknow.us.edu.pl/en/isp_eng/required-documents-and-registration-online/)



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### **Conditions of recruitment:**

1. The final result of the completion of the candidate's higher university degree (maximum 6 points, the conversion of diploma ratings: 6.0 (excellent) - 6 pts.; 5.0 - 5 pts. ; 4.5 - 4 pts.; 4.0 - 3 pts.; 3.5 - 2 pts.; 3.0 - 1 point).
2. Interview with a candidate will assess the knowledge, skills (an ability to design experiments to investigate new phenomena, test hypotheses and solve experimental problems), knowledge of English and scientific level of the submitted project of the doctoral dissertation (maximum 15 points).
3. The minimum number of points, which has to be obtained to be selected for the studies, is at least 14 points.
4. Eligible for studies shall be a person who obtain the highest number of ranking points up to fill the limit of places, subject to point 3.
5. Project implementation of doctoral dissertation (max. 2 pages) must be submitted by 15<sup>th</sup> August 2015.

### **Requirements:**

1. MSc degree (or equivalent) in Oceanography, Environmental Sciences, Applied Mathematics, Physics or Computer Science or similar science discipline. A candidate may submit application if the MSc Degree will be received not later than on 9<sup>th</sup> September 2015.
2. Knowledge about polar regions and current research problems specific to these regions.
3. General knowledge of physics and applied mathematics.
4. Experience with geophysical models.
5. Candidate should be familiar with numerical methods and possess fundamental skills in computer programming (e.g. Matlab, C, Fortran).
6. Capability to carry out visualization of spatial data in GIS (e. g. ArcGIS)
7. Understanding of various oceanographic measurement methods and interpretation of oceanographic data.
8. Good communication skills and capability to write in English in order to be able to participate in the international workshops and conferences as well as to present research results. Polish is not required.
9. Ability to work as a team member and to collaborate with other people.
10. Creativity and ability to think critically.
11. Previous participation in oceanographic conferences and/or co-authorship in research publications will be considered an advantage.



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### Tasks description:

1. Adapt selected ocean model to regional bathymetry and coastline.
2. Organize database with data for model forcing and evaluation.
3. Add data assimilation capabilities and improve model efficiency.
4. Design and run model simulations and compare results with available data sets and if possible with other regional models.
5. Investigate and describe environmental factors controlling fjord/large scale interactions using satellite remote sensing data, in situ data, and results from model simulations.
6. Work on research papers and conference presentations.
7. Study scientific literature related to the research aims of the project.
8. Write regular progress reports according to the agreed schedule.
9. Participate in institutional seminars and day-to-day work at the Institute of Oceanology of the Polish Academy of Sciences.

### Abstract

Recent progress in satellite remote sensing and numerical modeling has identified key variables and interactions affecting environmental processes in the oceans. Models represent these processes with mathematical expressions and reflect scientist's ability to describe quantitatively the behavior of the oceans. Satellite observations have in particular increased our knowledge of the polar regions, traditionally undersampled by in situ observations because of bad weather and very harsh conditions. One of the important observations from satellite remote sensing concerns large plumes of turbid waters entering the ocean at the exits from fjords. These plumes indicate zones of extremely dynamic interactions between land and ocean, with large amounts of freshwater and dissolved and suspended matter being discharged to the ocean.

PhD candidate employed in this project will investigate large scale/local interactions in two arctic fjords using numerical model and available observational data. The overall goal of this project is to quantify fluxes of water, total suspended matter (TSM), and organic carbon between arctic fjords and the adjacent ocean and to improve understanding of mechanisms and time scales that control variability of these fluxes. The study will include a comparison of two fjords, one located in the West Spitsbergen and the other one in the vicinity of the Barents Sea. These fjords have significant input of fresh water from land (from glaciers, rivers, melting snow, rain) and saline water from the ocean and can serve as representative examples to study freshwater and suspended matter



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fluxes between the land and the ocean in the Arctic and their feedbacks with external forcing. Example interactions that will be investigated are as follows. Variability in meteorological forcing has an impact on water temperature, salinity and density structure and exchange of water between fjords and the adjacent ocean. Increased inflow of low salinity water from fjords can modify hydrographic conditions in the ocean outside of the fjord. Fjord water is usually more turbid than the oceanic water, therefore increased inflow of fjord water can change optical properties in the ocean near the fjord entrance. Changes in the optical properties most likely can amplify climate-related trends in sea surface temperature, because more sunlight is absorbed in surface layer of more turbid water in comparison to clear water. Changes in the temperature and density stratification as well as changes in the sunlight available in the water column can cause shifts in phytoplankton functional types present in a given region. In addition melting glaciers and thawed permafrost soil are sources of increased amounts of dissolved organic and suspended matter in fjord waters. If more water with higher concentrations of various materials originating from land is delivered to the fjords, it is possible that more particulate and dissolved organic matter as well as mineral particles are transported into the ocean. This can cause a significant change in regional biogeochemical fluxes between the land and the ocean. Current knowledge about these and other environmental feedbacks is limited, but they have to be accounted for in regional and global models and predictions of climate change. This PhD project will improve our quantitative understanding of the most important interactions between land, fjords, and the adjacent ocean. Project will take advantage of multi-year interdisciplinary data sets available from satellite remote sensing such as sea surface temperature, sea surface salinity, sea surface height, wind speed and direction, and ocean color data products, as well as available in situ data. Links between ocean model and these data sets will be developed in order to obtain improved regional information and to study synoptic and interannual variability as well as multiyear trends in the interactions described above.

#### Other information:

1. The thesis supervisor will be **Professor Małgorzata Stramska (IO PAS)**.
2. In addition to the candidate's application submitted to KNOW it would be mandatory to send CV and the motivation letter to: [stramska@iopan.gda.pl](mailto:stramska@iopan.gda.pl).
3. Contact: [polarknow@us.edu.pl](mailto:polarknow@us.edu.pl) – Leading National Research Centre (Dr. D. Ignatiuk)



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