



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

ul. Bedzińska 60  
41-200 Sosnowiec  
tel. +48 32 368 93 80  
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www.mssd.us.edu.pl



**IEDS/2026/IO/01**

## **Title of PhD project: New approaches to old questions – biologically mediated particle formation and flux in the context of carbon uptake and sequestration**

**The leading unit:** Instytut Oceanologii Polskiej Akademii Nauk w Sopocie

### **Requirements:**

- 1) Completed master's studies in Oceanography, Marine Biology, or other relevant discipline.
- 2) Knowledge of research topics related to carbon cycle in the ocean
- 3) Ability to process and visualize data in analytical programs (e.g., R, Python, Matlab)
- 4) Knowledge of statistical methods for scientific data analysis
- 5) Good communication skills, with experience in presenting results at scientific conferences
- 6) Excellent command of written and spoken English

### **Preferred qualifications**

- 1) Experience in processing "big data", including use of machine learning
- 2) Experience in working with international teams and/or projects
- 3) Familiarity with concepts related to ocean modelling

### **Tasks description:**

1. Literature review of the topic, including the meta-analysis of available existing data
2. Processing and analysing unpublished data available in-house, together with open-source data, and if relevant newly collected data
3. Preparation of scientific articles and conference presentations
4. Preparing processed data for publication according to FAIR principles
5. Participation in field work activities if relevant to the project tasks
6. Regular reporting of work progress
7. Assistance in the daily scientific tasks during the realization of the project
8. International collaboration



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### **Summary of a doctoral project:**

Carbon cycling is one of the most important processes controlling climate and life on our planet, and the oceans play a crucial yet still insufficiently understood role in controlling the mechanisms of carbon uptake, turnover and sequestration. In particular, the role of changing biological activity has been identified as a key knowledge gap driving the next decade of integrated ocean carbon research (UNESCO, 2026).

The nature of plankton and co-existing particles is one of the most important factors determining the fate of organic carbon in the oceans. However, their direct impact is still not fully constrained. Moreover, numerous climate mitigation initiatives assume that enhanced primary production is able to resolve the problem of the excess carbon dioxide in the atmosphere. However, the question “Does greening of the ocean lead to higher carbon sequestration?” still remains unanswered explicitly. Therefore, one chapter of the thesis is planned to oscillate around better understanding and quantifying coupling of biological activity, organic matter production, utilization and subsequent export rates. Additionally, seasonal changes in the plankton community (e.g., diatom vs. flagellate dominance) manifested in distinct surface-optical “fingerprints” as derived from satellite imagery will be correlated with observed and/or modelled estimates of particulate organic carbon (POC) fluxes.

There are numerous ways in which the flow of carbon through the marine ecosystems may be hindered or stimulated, including effects of bio-physical interactions (e.g. effects of stratification, environmental gradients, diverse blooms, remineralization rates, turbidity regimes, freshwater supply etc.). One part of this project will be to focus on the impact of such habitat settings on controlling the efficiency of carbon fluxes. For example, various “biological modes” will be selected (e.g., diatom bloom, flagellate-dominated, small-cell-oceanic, river-influenced, ice-melt-influenced) as a kind of ‘context twins’ representative of possible future ecosystem states in response to scenarios of climate change. Consequently, it will be tested how each mode shapes the magnitude, composition, and attenuation of particle flux in order to advance our capacity to understand and model ocean carbon uptake and storage.

The other important challenge of the PhD project will be to verify how current, globally used assumptions (e.g. model carbon fluxes constrained by so-called Martin’s curve parameters) compare with what we observe in nature. The candidate is thus expected to examine large global data sets (e.g. from Argo floats) to identify new patterns and regional inconsistencies with respect to those common assumptions. One of the resulting objectives will be to build a new library presenting how particle typology modifies the expected carbon fluxes, which in turn would enable better representation of biological processes in Earth System models.

An additional innovative aspect of this PhD project comes from the need to develop a harmonized approach to analyze data from a myriad of possible observing approaches such as



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multi-sensor taxonomy-size spectrum from plankton nets, UVP, PlanktoScope, and sediment-traps, along with sources of hydrographic & geochemical information (POC, PIC, stable isotopes), and corresponding satellite-derived indices.

**Other information:**

The work will be carried out under supervision of: dr hab. Emilia Trudnowska, prof IOPAN, [emilia@iopan.pl](mailto:emilia@iopan.pl), & dr Artur Palacz [palacz@iopan.pl](mailto:palacz@iopan.pl)

The PhD project will be realized in the larger context of current national (NCN, OPUS, T-Trait), EU funded projects such as BioEcoOcean ([www.bioecoocean.eu](http://www.bioecoocean.eu)), SEA-Quester ([www.sea-quester.eu](http://www.sea-quester.eu)), and USA projects funded by NSF (e.g., „Capturing marine particle diversity to sharpen our vision for the biological carbon pump: a micro- to ocean-scale transdisciplinary approach”), which will provide an opportunity to increase scholarship by 30-50%.

Contact to the secretary of the IEDS doctoral school: +48 32 3689 380, e-mail: [polarknow@us.edu.pl](mailto:polarknow@us.edu.pl).

Website: <https://www.mssd.us.edu.pl/en/admission-2026-2027/>



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**ADDITIONALLY, IN THE CASE OF A RESEARCH PROJECT IN WHICH THE DOCTORAL SCHOLARSHIP  
WILL BE PAID OUT OF EXTERNAL FUNDS.**

**Please enter the amount of the doctoral scholarship: .....**

**Schedule of the recruitment procedure:**

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**Conditions and the mode of the recruitment procedure:**

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**Information regarding conditions for granting the scholarship:**

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**Information on the required documents:**

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