

# Multiscale variability of circulation and its role on the state of the marine environment in the Baltic Sea

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## Summary

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*The Baltic Sea is a complex marine system with several environmental problems. The role of circulation in shaping the state of the marine environment is not well understood. Uncertainties in linking the state of the marine environment with anthropogenic pressures and natural processes and predicting its future developments are largely connected to the shortage of understanding of the current regime in the Baltic Sea. This limited knowledge is at least partly related to the lack of joint experiments of in-situ current measurements and high-resolution numerical simulations. Particularly, understanding of temporal developments of currents in the submesoscale, synoptic (mesoscale) and seasonal timescales in the Baltic Sea needs improvement. The present PhD project addresses this shortage.*

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| Research field:       | Earth sciences  |
| Supervisors:          | Dr. Germo Väli<br>Dr. Taavi Liblik  |
| Availability:         | This position is available.   |
| Offered by:           | School of Science<br>Department of Marine Systems   |
| Application deadline: | Applications are accepted between June 01, 2022 00:00 and June 30, 2022 23:59 (Europe/Zurich) |

## Description

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Variability of circulation is an important driver shaping the physical and biogeochemical fields in the ocean. The main aim of the project is to investigate the currents in various spatio-temporal scales and their impact on the marine environment in the Baltic Sea. The main research questions of the PhD project are: What are the spatial current patterns and meridional transports under various forcing conditions in the central Baltic? What are the connections between the sub-surface circulation in the central Baltic Sea and the water properties in the northeastern Baltic Sea? What are the consequences of anthropogenic structures on the current structure and water exchange? What is the role of the current field on the pathways of microplastics in the Baltic Sea? State-of-the-art in-situ measurements and numerical simulations will be used in the study.

Acoustic current profiler measurements, particularly the data collected across the central Baltic Sea in the frame of CABLE (Central Baltic Sea Circulation Experiment), will be used in the study. Likewise, data from the underwater glider, Keri offshore station and other moorings will be analyzed. Observations will be backed by the data from the dedicated high-resolution model (GETM) simulations.

### Supervisors:

Main supervisor: Dr. Taavi Liblik  
Co-supervisor: Dr. Germo Väli

### Responsibilities and (foreseen) tasks

- Participate in scientific cruises and analyze the gathered data.
- High-resolution model setup for the Central Baltic, Gulf of Riga and Gulf of Finland will be built by the applicant and multi-year simulations will be performed at TalTech High Performance Computing Centre and the data will be analyzed.
- Lagrangian particle model setup will be developed and run to investigate the pathways of microplastics in the Baltic Sea.
- Compile and run the simulations addressing the impact of anthropogenic structures (e.g. wind farms, dams etc.) on the current regime and water exchange.

**Applicants should fulfil the following requirements:**

- Successful applicant is expected to have MSc. in Natural Sciences.
- Programming skills and understanding (e.g. Python or MatLab) are required.

**The following experience is beneficial:**

- Knowledge about FORTRAN and Linux/Unix system.
- Previous work experience regarding the Baltic Sea.

The applicant should submit the research plan.

**We offer:**

- The PhD student can work in the team of the division of marine physics (DMP) at TalTech.
- Opportunities for conference visits, research stays and networking with other universities and institutes.

**Additional information**

For further information, please contact Taavi Liblik [taavi.liblik@taltech.ee](mailto:taavi.liblik@taltech.ee) and Germo Väli [germo.vali@taltech.ee](mailto:germo.vali@taltech.ee).



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