Verification of the dominant role of geostrophic circulation in the Baltic Sea using machine learning algorithms

Summary

The research topic consists of the verification of the main physical features in the numerical circulation model results and satellite remote sensing fields that are governed by a simple dynamical relationship. The focus is on the verification of baroclinic and barotropic geostrophic motions using machine learning algorithms.

Research field:	Earth sciences
Supervisors:	Sander Rikka Dr. Ilja Maljutenko
Availability:	This position is available.
Offered by:	School of Science Department of Marine Systems
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

Description

Numerical ocean circulation models and biogeochemical models have reached a certain competence level, which is difficult to advance using conventional approaches of the oceanographic numerical modelling. Same time the numbers of in situ and remote observation datasets has increased over time, making it feasible to develop AI aided data integration algorithms which would improve the understanding of the ocean dynamics and further help to reduce the uncertainties of the numerical models. Hereby, our research group is taking a step forward by combining machine learning methods and algorithms in improving the performance of the numerical oceanographic models. The machine learning method has shown potential to identify significant dynamical features in the ocean model dynamics and allocate the uncertainties in time and space, which are further necessary for the data integration.

Supervisors:

Main supervisor: Ilja Maljutenko
Co-supervisor: Sander Rikka
Advisor: Urmas Raudsepp

The main aim of this project is to find out which processes are dominant in particular output of the numerical circulation model and satellite remote sensing data.

- Task 1: Development of the algorithm for the verification of the geostrophic circulation in the Baltic Sea.
- Task 2: Implementation of the developed algorithm for the set of the ocean circulation model results. Preparation of the paper about the method with the implementation results.
- Task 3: Extension of the algorithm of verification of the baroclinic geostrophic circulation features to the barotropic case. The analysis of the satellite altimetry data with the aim to verify coincidence of the sea level pattern and barotropic geostrophic motion. Preparation and publication of the paper about the possibilities of detection of the barotropic circulation pattern in the satellite altimetry data.
- Task 4: A paper about the implementation of the verification algorithm to the simultaneous remote sensing altimetry data and the simulated sea level by the numerical model will be prepared and submitted for publication.

Applicants should have a Master's degree in one of the following subjects: earth sciences, mathematics, physics, computer science, data science.

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