

Suran Nikzad

(Supervisor: Dr. Markus Schartau, Professor Kai Wirtz; External: Professor Anders Omstedt)

The effect of DOM on ocean-atmosphere interface processes (a model study)

The purpose of my PhD project is to study the impact of dissolved organic matter (DOM) on the physical and chemical processes at the interface between the ocean and atmosphere. This includes to resolve the role of the surface micro layer for air-water exchange processes and to improve model flux estimates for gaseous and particulate organic matter. The first step will be to assess an existing version of an ecosystem model coupled to a one-dimensional physical model of the water column (GOTM¹). This module will be intergraded to the current KOE ecosystem model, with the purpose of obtaining reliable estimates of DOM accumulation rates within the micro layer. Subsequently, a series of sensitivity analyses is planned to specify model uncertainties. In order to confirm and improve the model performance, observations (provided by SOPRAN²) will be assimilated into the model, using a systematic parameter optimisation based on a quasi-stochastic genetic algorithm. In particular, experimental data will be considered to quantify the CO₂ impact on organic matter exudation as well as pH effects on DOM hydrolysis. Ultimately, the oceanic model results (output) will be applied as an input/boundary condition for the atmospheric transport model (CMAQ³), as it provides a "seasonal" source for the formation of primary organic aerosols. The envisaged CMAQ simulations aim at quantifying the possible impact of ocean derived DOM on aerosol formation.

1. General Ocean Turbulence Model

2. The Surface Ocean Processes in the Anthropocene, as a national contribution to SOLAS

3. Community Multiscale Air Quality Modeling System