

**PROJECT TITLE: Seasonal and interannual variability in the vertical flux of particulate organic carbon in the North Atlantic, PI: Malgorzata Stramska, CHORS, SDSU
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We are looking for a potential graduate student to join the following project funded by NASA. In this project we will use 3D physical ocean model NORWECOM combined with ocean surface particulate organic carbon (POC) concentrations derived from ocean color satellite data to study POC dynamic in the North Atlantic. Growing concerns over the issue of climate change have amplified efforts on understanding the temporal evolution and potential feedbacks of the global carbon cycle. At present, it is generally believed that ocean acts as an important sink for anthropogenic CO₂, and model projections suggest that the oceanic uptake will continue to play a major role in drawing down excess atmospheric CO₂. Analysis of the distributions and magnitudes of POC concentration and export are important for understanding the potential of the marine biosphere for affecting the global carbon cycle.

In our work, concentrations of the POC will be determined for the period since the beginning of the SeaWiFS mission using an ocean color algorithm developed recently by our group (Stramski et al, 2007). These POC data will serve as an input to the ocean model. Our multi-year model simulations of POC dynamics will allow us to derive POC flux out of the photic zone into the deep ocean. In contrast to in situ measurements, which usually provide insufficient data for resolving spatial and temporal scales of variability of POC export, our method based on the combination of satellite data and model simulations will be capable of providing export estimates for large regions over relatively long time scales. We will compare our estimates of POC export with similar estimates from available in situ data and ecosystem models. This proposal includes an international collaboration with the Institute of Marine Research (IMR) in Bergen, Norway and Alfred Wegener Institute for Polar and Marine Research (AWI), Bremerhaven, Germany.

The work plan:

Year 1:

- Develop computer codes for converting ocean color satellite data to surface POC concentrations in the north polar Atlantic;
- Compute surface POC concentrations from satellite imagery and assemble the POC database in the format appropriate for the input to the North Atlantic ocean model (NORWECOM);
- Establish internet environment/links for exchange of data, results, and discussion with European collaborators;
- Assimilate the satellite-derived POC to the NORWECOM model and start model simulations (in collaboration with IMR (Norway) scientists: Prof. Einar Svendsen, Dr. Paul Budgell, and Dr. Morten Skogen).

Year 2 and 3

- Complete runs of the ocean model for the entire period of existing ocean color satellite missions (1997-2007);
- Analyze surface POC concentration and POC flux variability with relation to atmospheric and physical forcing and document trends and patterns;
- Compile a database with historical data which can be compared with our model results (POC concentrations, profiles of bio-optical and physical data, POC fluxes);
- Compare results from our model calculations with other models, for example inverse models of POC fluxes (in collaboration with Prof. Reiner Schlitzer, Germany, AWI), nitrogen-based ecosystem models with implicit size structure in phytoplankton (in collaboration with Dr. M. Skogen, IMR), and primary productivity estimates from existing models and remote sensing data;
- Work on research papers and conference presentations;
- Establish, advertise, and maintain/update a research-based educational website in the format understandable for non-scientists.