Poster Presentation
Theme 3.1: Biogeochemical Processes - Processes Understanding and Human Impacts
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The impact of the Amazon River plume on the CO2 sea-air exchange in the Tropical Atlantic Ocean

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The Amazon River delivers large amounts of nutrients to the ocean, enhancing phytoplankton production in the otherwise oligotrophic tropical North Atlantic substantially. Observations suggest a progression of the phytoplankton community composition from the mouth of the river to the open ocean, with diatom-diazotroph assemblages (DDAs) becoming increasingly dominant. These diatom-diazotroph assemblages have been hypothesized to fuel carbon sequestration and to explain the observed anomalously low pCO2 values in the areas influenced by the Amazon plume. Here we aim to better constrain and understand the complex interplay of physical and biogeochemical processes that leads to this unique effect of the Amazon plume on the tropical North Atlantic. To this end, we embedded the Biogeochemical Elemental Cycle model (BEC) within an eddy-resolving configuration of the Regional Oceanic Modeling System (ROMS) and using a novel telescopic grid with a high resolution at the mouth of the river (4 km) while covering nearly the entire Atlantic Ocean. The model reproduces the basin-scale currents structure and the variability of the plume pathways; it also generates phytoplankton blooms that compare well with observational data-sets. In agreement with *in situ* measurements, mesohaline waters (20 – 24 PSU) that are rich in phosphate and silicic acid but poor in nitrate constitute a niche for DDAs associated with high rates of N-fixation. These blooms support important carbon export (net flux between 1.5 and 15 Tg C yr-1) which changes the air-sea pCO2 gradient and turns these waters into a sink of CO2. Our sensitivity analysis shows that the magnitude of the carbon sequestration is highly dependent on the amount and properties of the nutrients supplied by the Amazon River. However, physical components such as advection and residence time of the waters are also crucial as they determine the onset and the length of the blooms, and subsequently the efficiency of the biological pump. Any disturbance of this balance related to climate change or land use changes will affect the CO2 uptake of the Amazon River plume.

Poster Session (see poster session schedule)