2018 OCEAN SCIENCES MEETING
AGU • ASLO • The Oceanography Society
11–16 February • Portland, Oregon

BN51A-07: The imprint of the Amazon River on nutrients cycling and carbon export in the western tropical Atlantic Ocean

Friday, February 16, 2018
09:30 AM - 09:45 AM
Oregon Convention Center - D137-D138

The Amazon River delivers large amounts of nutrients to the ocean, leading to a substantial enhancement of phytoplankton production in the otherwise oligotrophic tropical North Atlantic. A unique group of phytoplankton associated with this plume are the symbiotic diatom-diazotroph assemblages (DDAs), which have been hypothesized to fuel carbon sequestration and to explain the observed anomalously low pCO_2 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 used a four phytoplankton version (diatom, small phytoplankton, DDA, *Trichodesmium* diazotroph) of the Biogeochemical Elemental Cycle model and embedded it within an eddy-resolving configuration of the Regional Oceanic Modeling System (ROMS). For this Amazon configuration, we developed a new telescopic grid with a high resolution at the mouth of the river (<4 km) while covering nearly the entire Atlantic Ocean. In agreement with recent studies, we could divide the plume waters along the salinity gradient into three types: an estuarine type characterized by an heterotrophic regime, a mesohaline type where DDAs become dominant, and an oceanic type where *Trichodesmium* prevail. The initial results from our model suggest that the nutrient distribution is the main factor shaping the different phytoplankton niches across this plume continuum. DDAs that can fix nitrogen are thus favored in mesohaline waters, rich in phosphate and silicic acid but poor in nitrate. These unique nutrient ratios are a consequence of the riverine inputs, the biological activity itself and the exchanges at the water-sediment interface (ordered in relative importance), but their interaction are strongly modulated by transport and mixing. In our simulations, advection, tidal mixing and stratification appear to be crucial as they determine the pathways of the plume, its mixing with oceanic waters and the persistence of the niche for the phytoplankton. Any disturbance of this balance related to climate change or land use change will affect the DDA community with potential consequences on the biological pump and the CO_2 uptake of the Amazon River plume.

Plain Language Summary

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