

Microbial Community Structure in the Amazon River Plume

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November 23, 2022

Abstract

The Amazon River discharges more than 200,000 m³ s⁻¹ into the Western Tropical Atlantic Ocean from May to June. The low salinity surface plume extends more than 1800 km from the mouth and covers an area greater than 1 million square kilometers. We hypothesize that the plume exhibits distinct microbial community assemblages driven by plume age, nutrient supply, and light availability. We collected samples for nutrients and flow-cytometry measurements to investigate the spatial variability of the cyanobacteria *Prochlorococcus* spp. and *Synechococcus* spp., picoeukaryotes, and heterotrophic bacteria. Overall the surface salinity of the water we sampled ranged from 15.5 ppt at the southernmost station to 36.3 ppt in the open ocean station. The surface nitrate and soluble reactive phosphorus concentrations ranged from below detection limit to 3.3 μ M and 2 μ M, respectively. Generally, in the freshest surface plume waters (15-28 ppt) we found the highest abundances of *Synechococcus* spp., picoeukaryotes, and heterotrophic bacteria with little or no *Prochlorococcus* spp. In the transition of surface salinities from 28 ppt to 32 ppt, a population of *Prochlorococcus* spp. began to form below the surface plume while *Synechococcus* spp. abundances at the surface remained unchanged and picoeukaryotes, and heterotrophic bacteria abundances decreased. As the surface salinity climbed over 32 ppt, the *Prochlorococcus* spp. abundance was uniformly high throughout the euphotic zone. On the other hand, as surface salinities increased over 32 ppt *Synechococcus* spp. abundances at the surface gradually decreased, while picoeukaryote and heterotrophic bacterial abundances remained constant. We will discuss changes in the microbial community composition as a function of nutrient and light availability, as well as plume age in the Amazon Plume-Ocean continuum in both surface and deep chlorophyll maximum assemblages.

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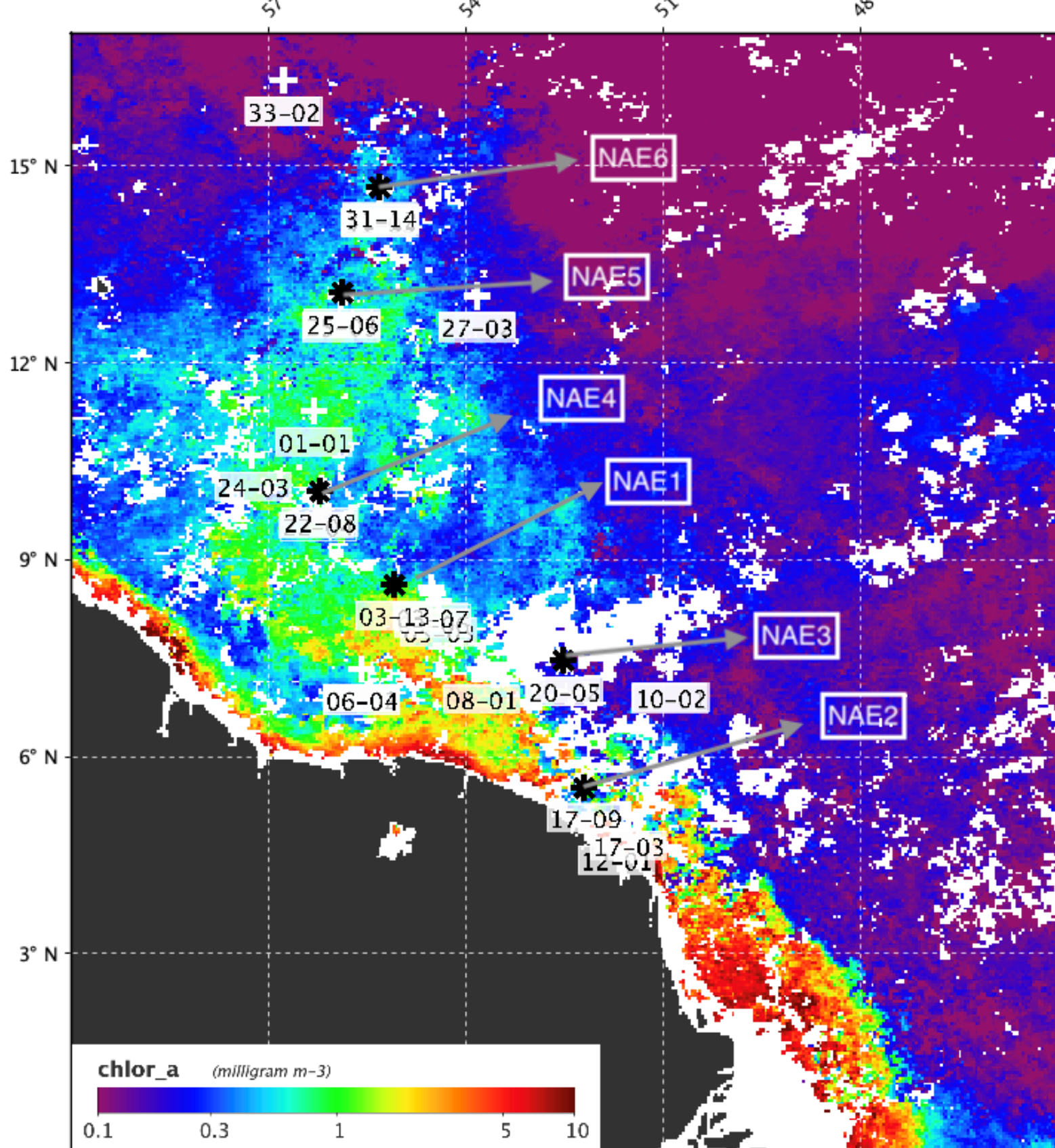
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Background

Amazon River Plume

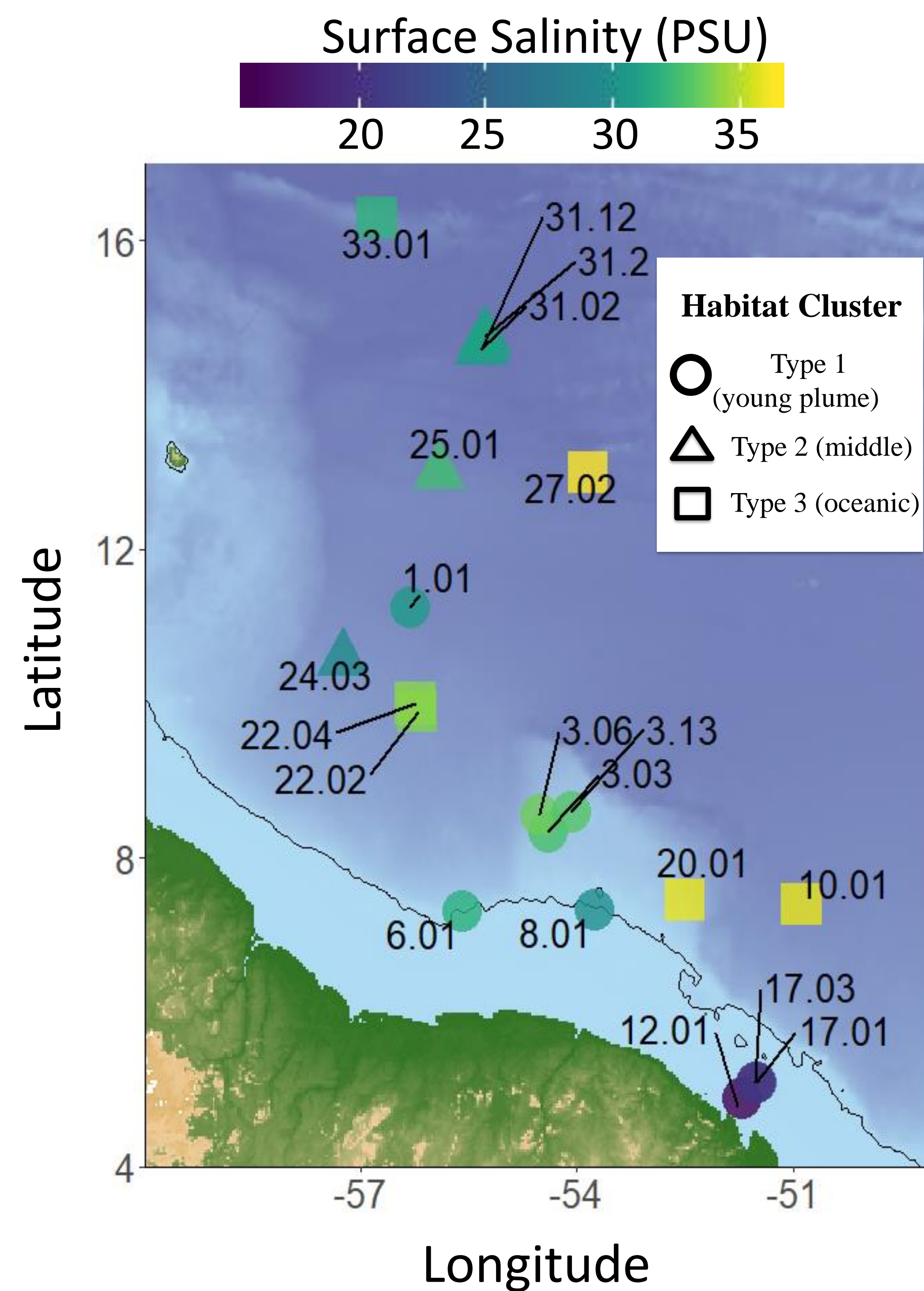


May-June:
-High-flow season
-Amazon River Plume extends to the north where it is then elongated

Patchy system, strong differences in various properties in places close to each other

Results

Stations



Conclusions

Prochlorococcus:

Young Plume: Absent in water column until salinity of ~29 PSU
Middle Age Plume: High abundances 30-50m
Old Plume/Oceanic: Found in high abundances throughout upper 75m

Synechococcus:

Young Plume: Moderate abundances at surface in young plume stations
Middle Age Plume: Higher abundances in upper 50m as the surface plume ages
Old Plume/Oceanic: Abundances decline as surface waters reach oceanic salinity
Species composition potentially changes as we move from fresher waters close to coast to oceanic waters far offshore.

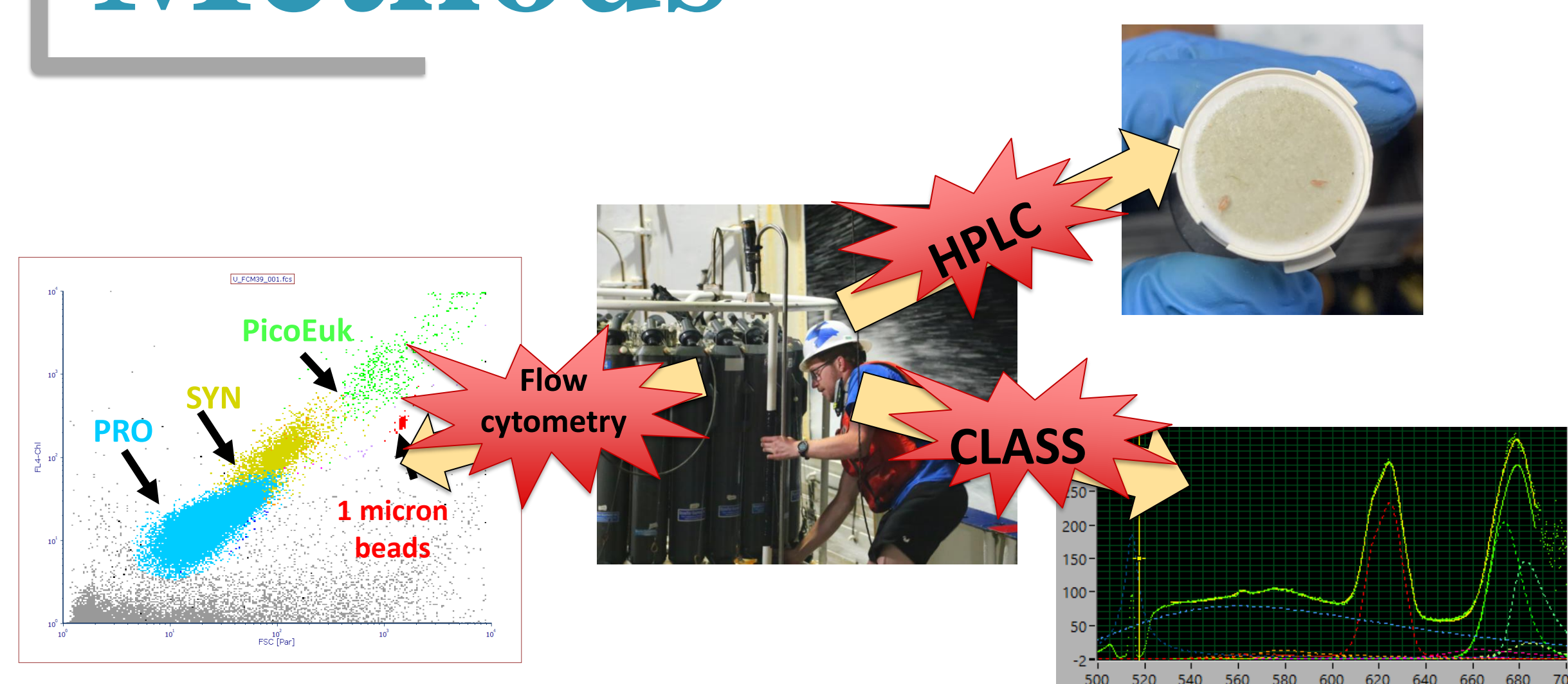
Picoeukaryotes:

Young Plume: High at surface and at ~50m, likely associated to high surface nutrients
Middle Age Plume: Abundances decline with nutrient concentrations at surface and vary from very high to low at ~50m
Oceanic: Abundances are moderate in upper 100m. Appear to contribute more to DCM.

Diatoms:

Particularly high abundances in young plume stations and in middle-aged plume stations with upwelling.

Methods



Acknowledgements

Thank you to the crew and scientific team on the R/V Endeavor for help with collecting these samples. This work was supported by the US National Science Foundation grant OCE 1737128 to Ajit Subramaniam.

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Average Profiles

