

Community composition, biomass and photosynthetic competency of phytoplankton associated with microscale features and frontal zones of the Gulf Stream

Christy Jenkins, Joaquim I. Goes, Helga do R. Gomes, Alex Chekalyuk

Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE

Robert A. Arnone



THE UNIVERSITY OF
SOUTHERN MISSISSIPPI.



BROAD OBJECTIVES

Examine the distribution and photo-physiology of phytoplankton functional types (PFTs) associated with microscale features and frontal zones in the Mid-Atlantic Bight shelf region using high resolution flow through measurements

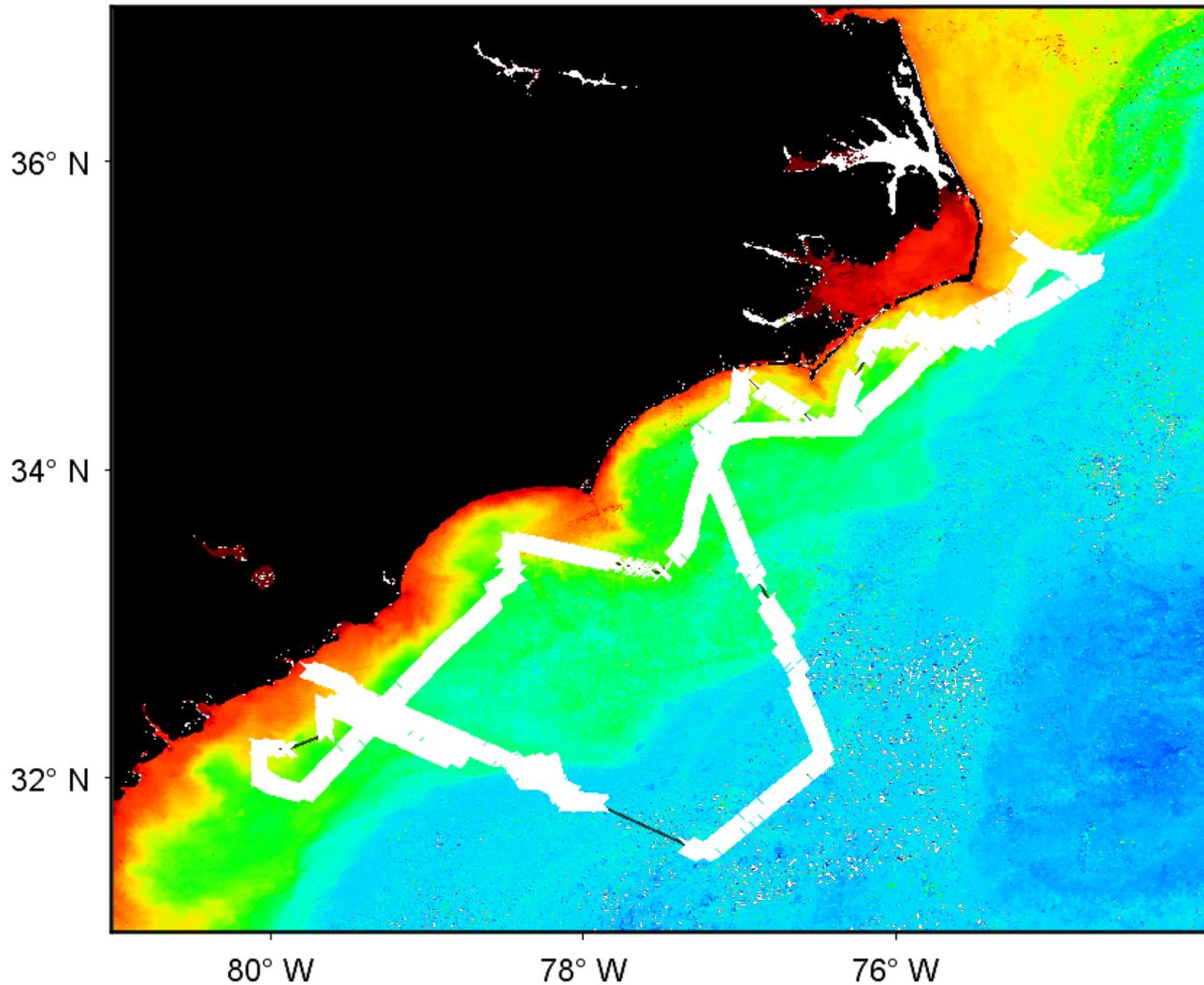
Examine the potential of flow through measurements for enhancing the utility of satellite ocean color for PFT biomass and productivity estimates

FLOW-THROUGH SETUP

- ❑ Automated Laser Fluorometer (Chl *a*, CDOM, PE-1, PE-2, PE-3, Fv/Fm, NPQ, PQ)
- ❑ Satlantic FRe (Chl *a*, Fv/Fm, sPSII)
- ❑ bbe-Moldaenke (Chl *a* - Diatoms, Cryptophytes, Green Algae, Cyanobacteria)
- ❑ FlowCAM (Phytoplankton imaging, taxonomy and size classification)

○ WATER COLUMN MEASUREMENTS

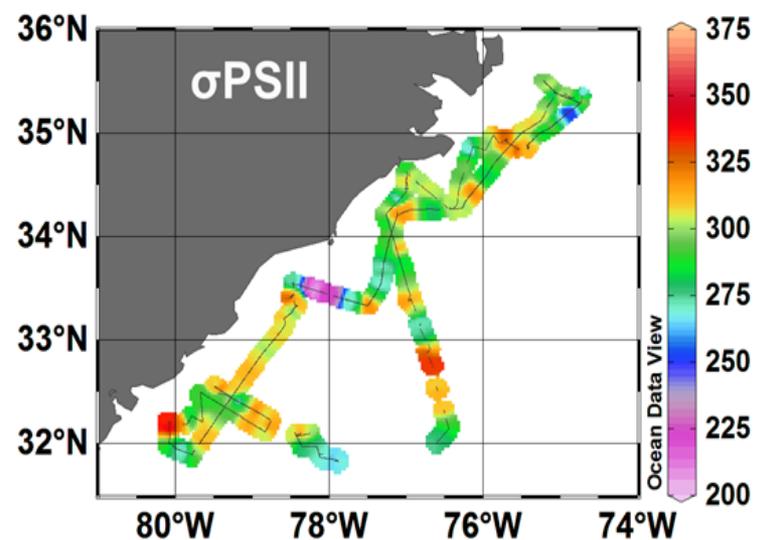
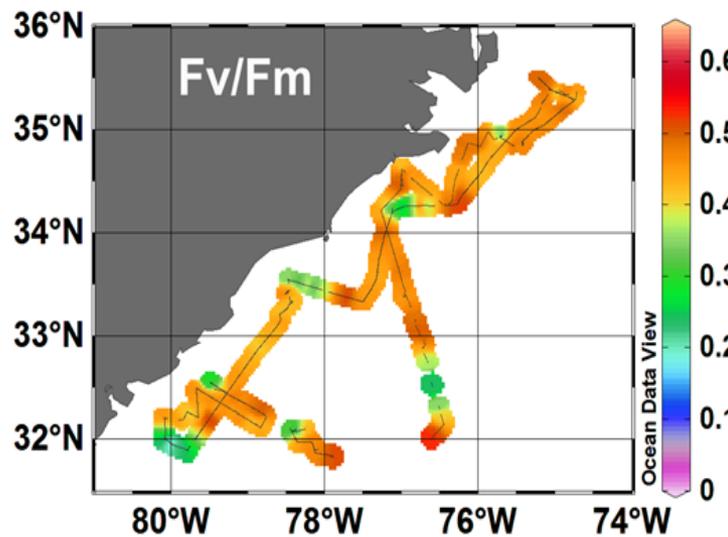
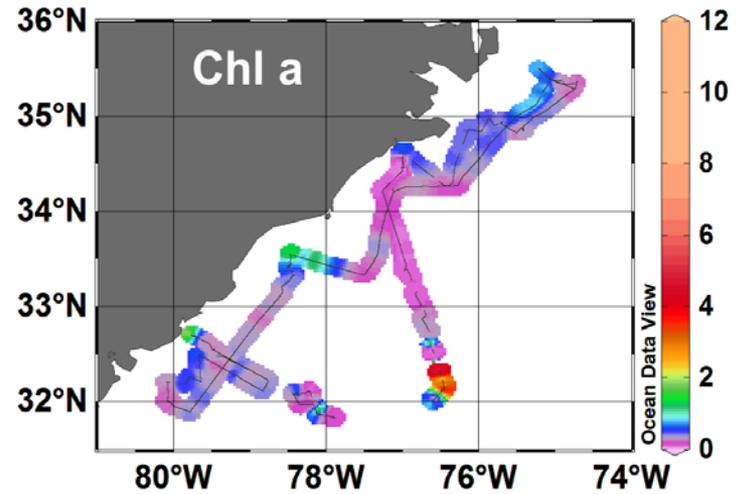
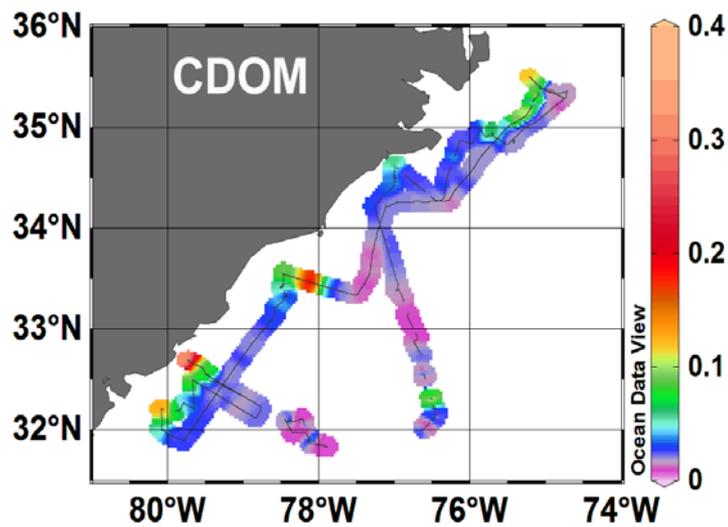
- Automated Laser Fluorometer (Chl *a*, CDOM, PE-1, PE-2, PE-3, Fv/Fm, sPSI)
- Satlantic FRe (Chl *a*, Fv/Fm, sPSII, Electron Transport Reactions)
- FlowCAM (Phytoplankton imaging, taxonomy and size classification)
- Phycobilipigment estimates in seawater



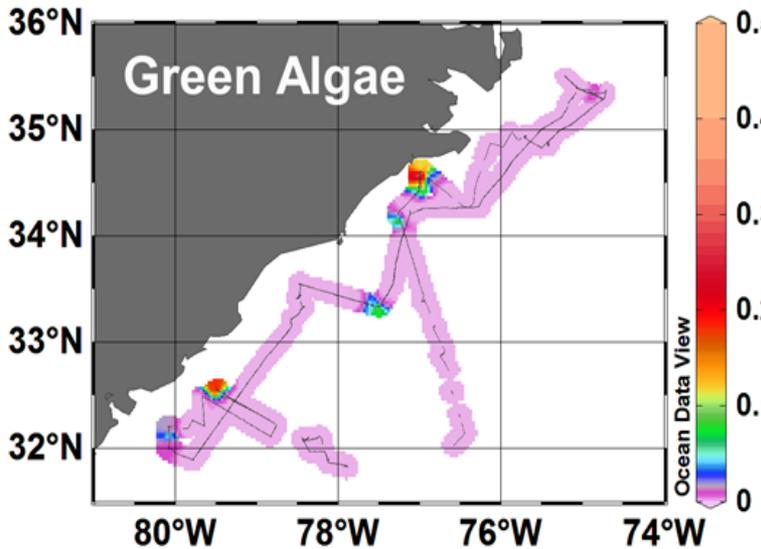
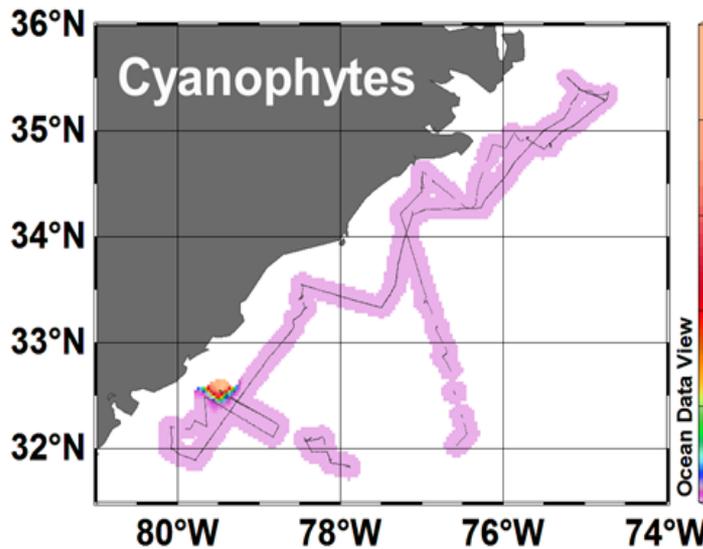
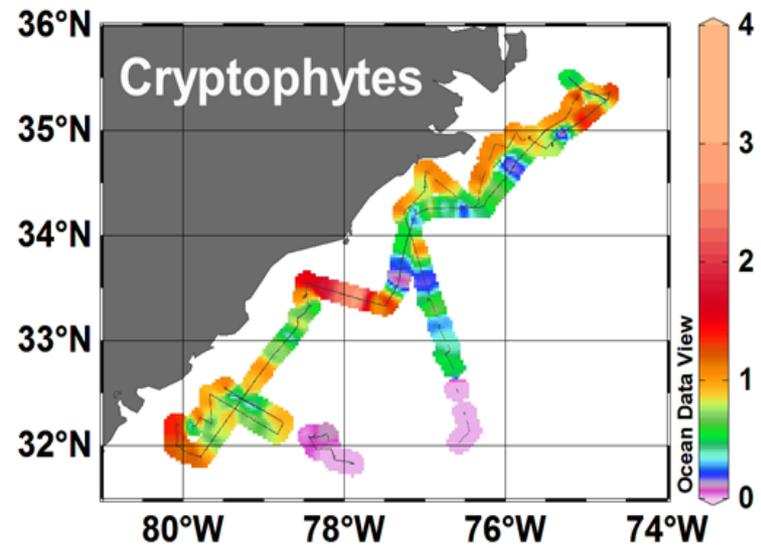
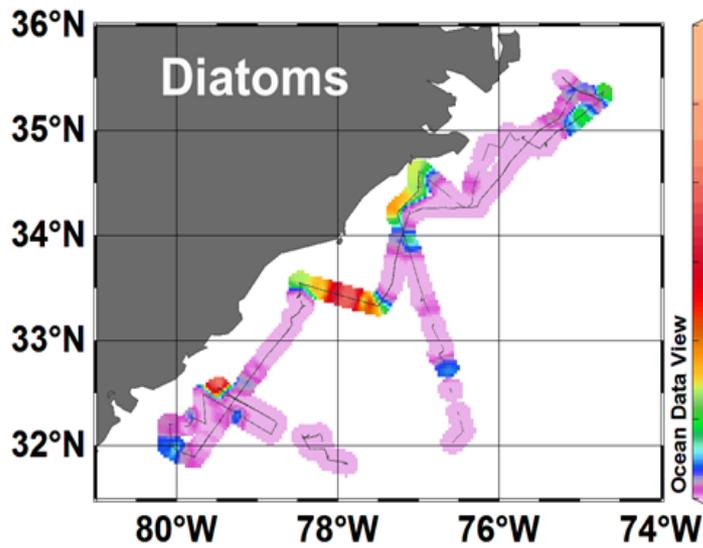
R/V Nancy Foster cruise track overlaid on VIIRS Chl data binned for the 1st week of Nov. 2014



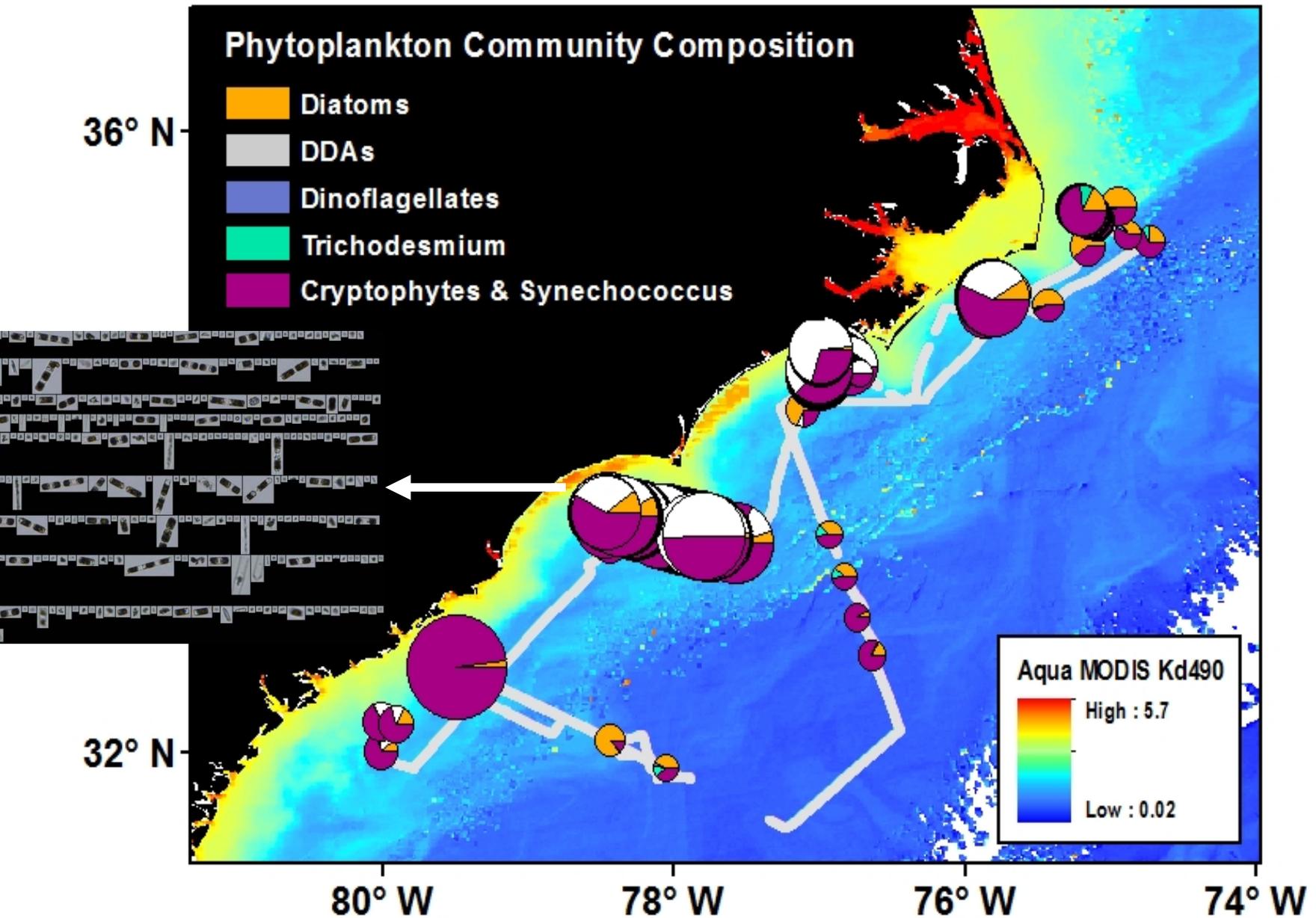
Flow through set up



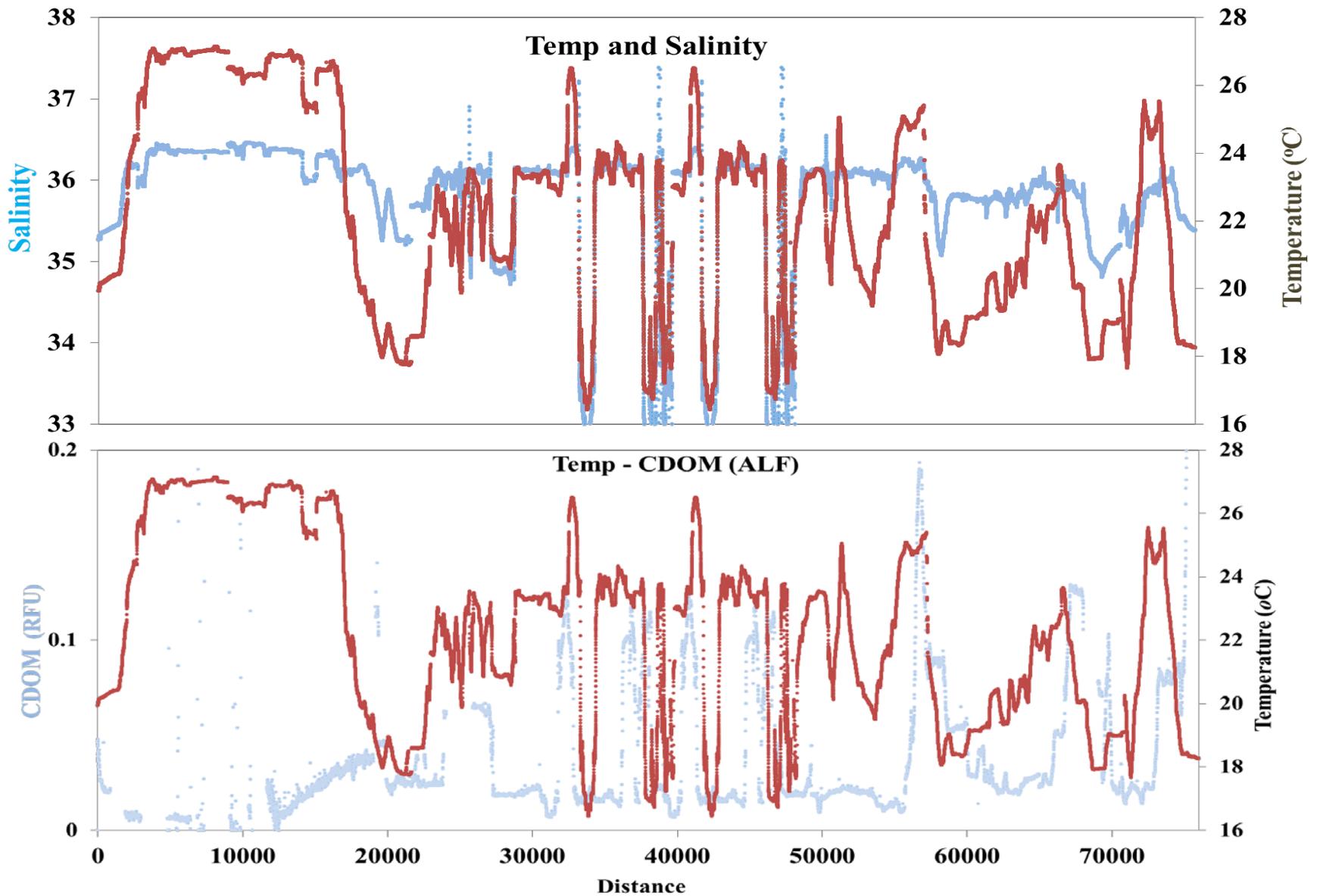
Distribution of CDOM, Chl *a*, variable fluorescence and σ_{PSII} along the cruise track as measured with the flow through system



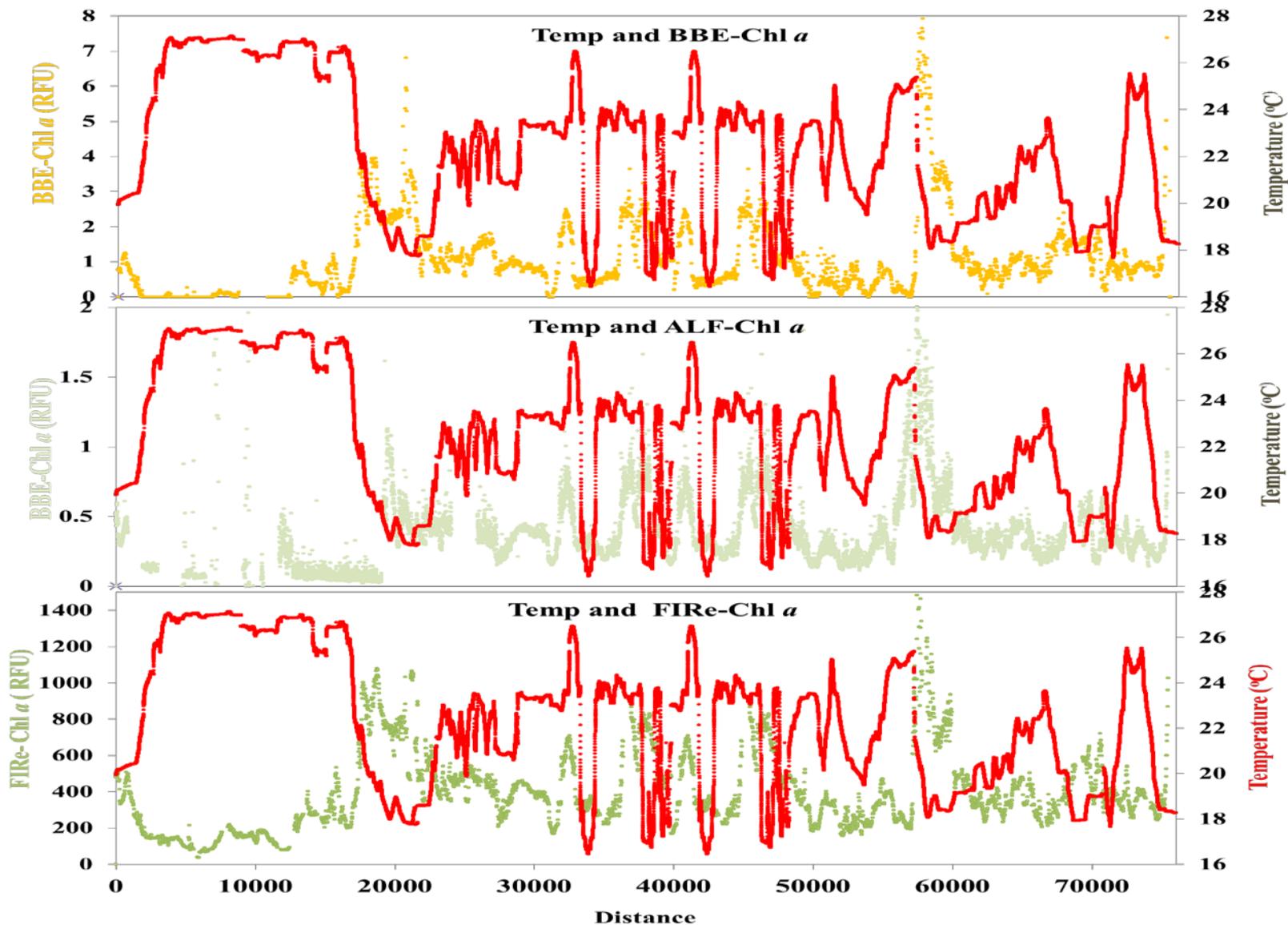
Distribution of biomass of PFTs along cruise track measured by bbe Molaedanke



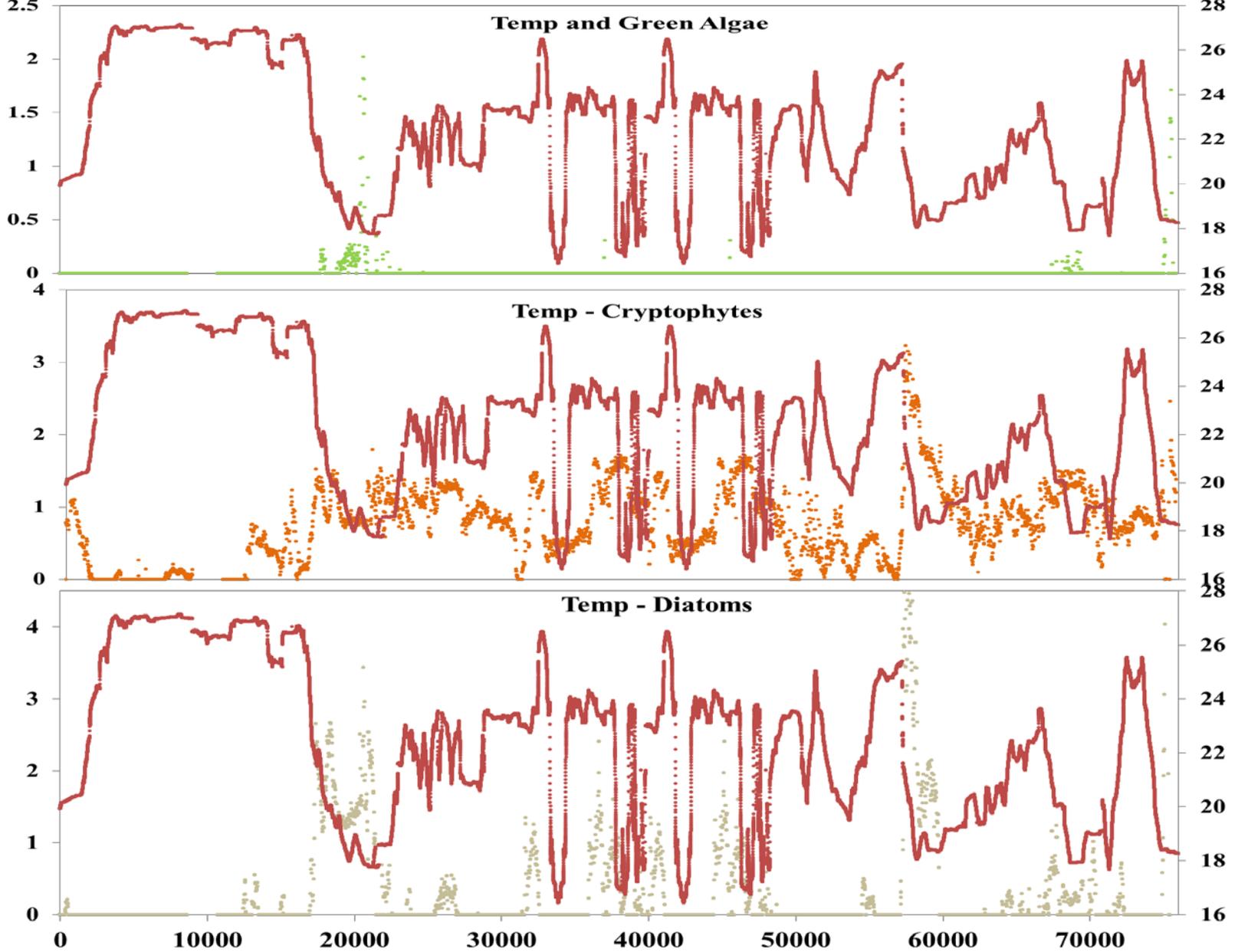
Distribution of major PFTs along the cruise track using FlowCAM



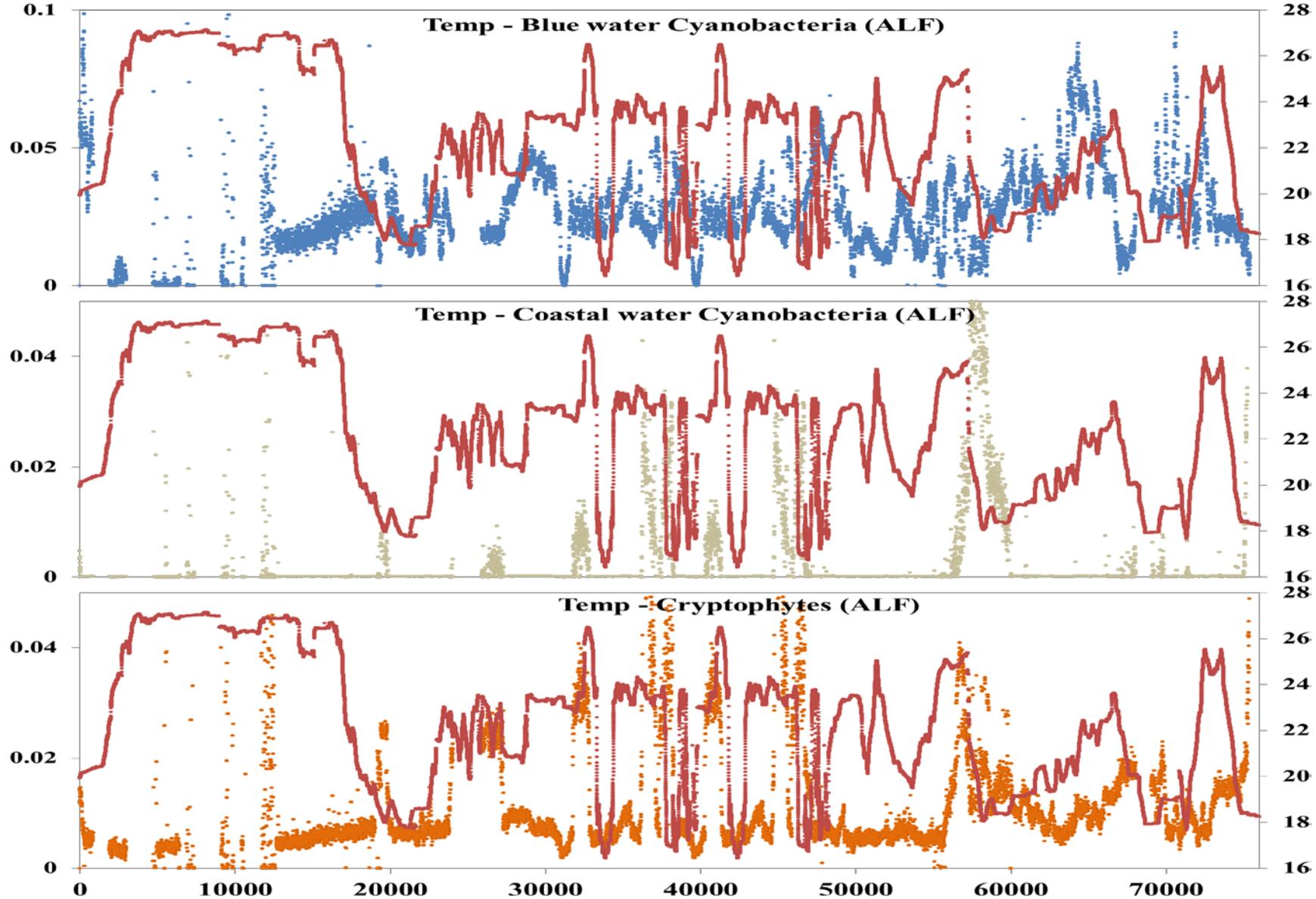
Distribution of CDOM, temperature and salinity along the cruise track



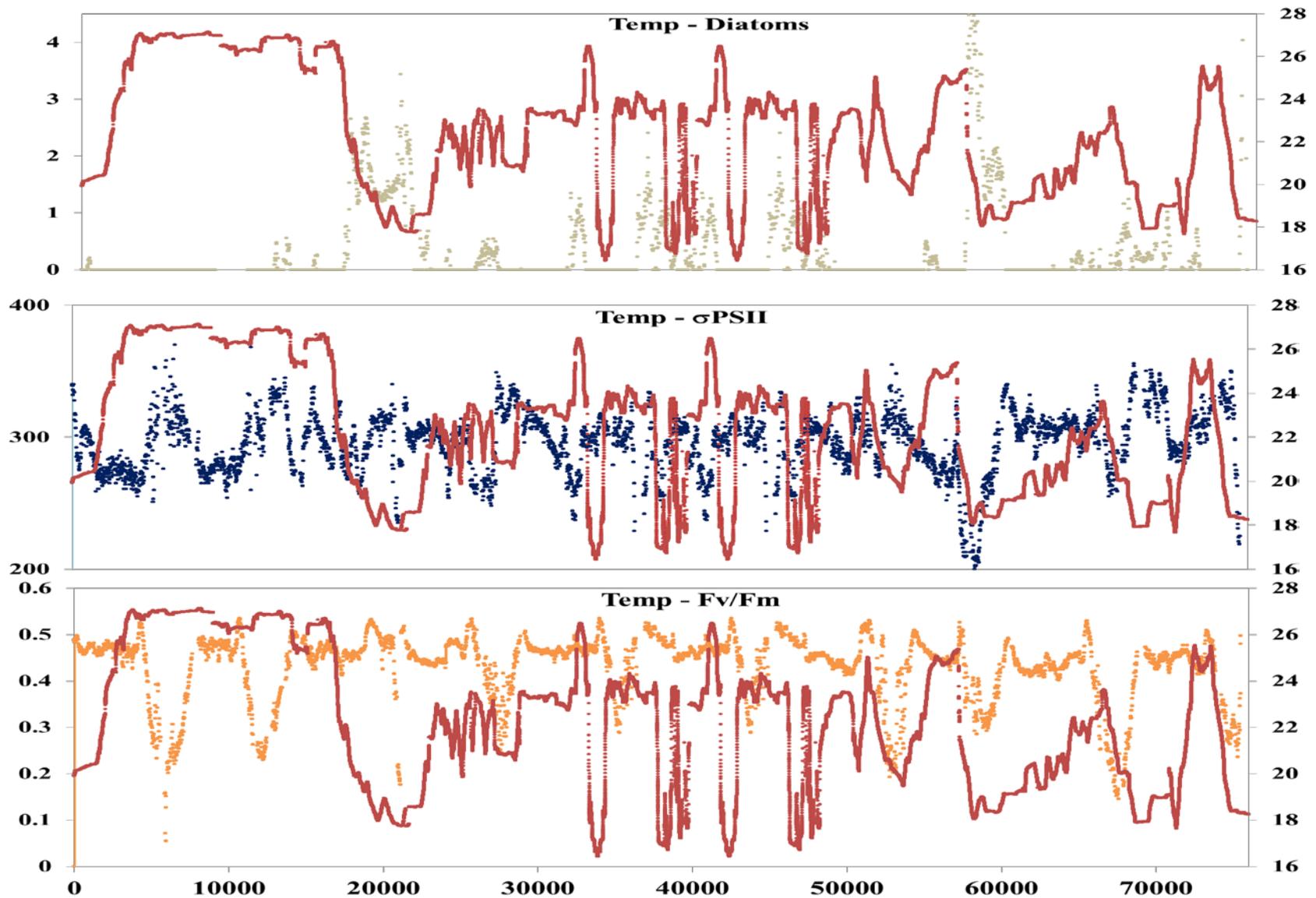
Distribution of Chl *a* (measured by three different instruments) temperature along the cruise track



Variations in major PFTs with temperature along the cruise track (measured by bbe)

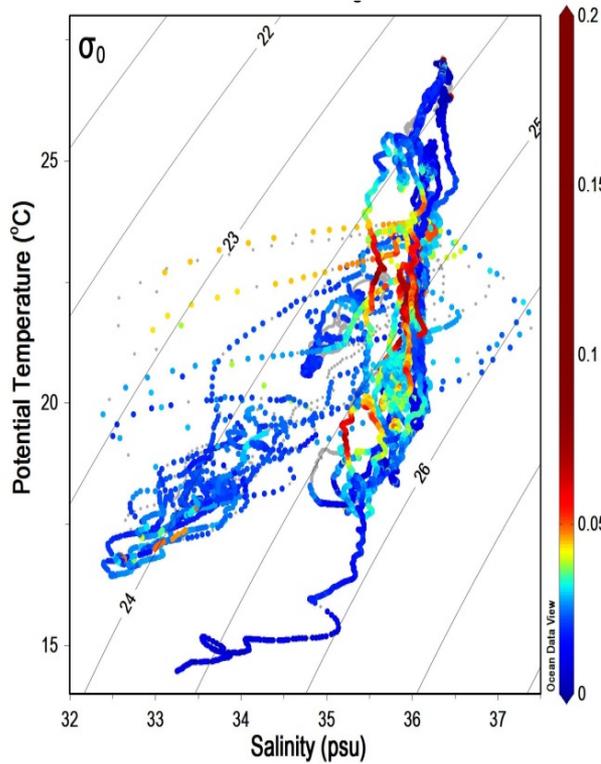


Variations in major phycobilipigment containing PFTs with temperature along the cruise track (measured by bbe)

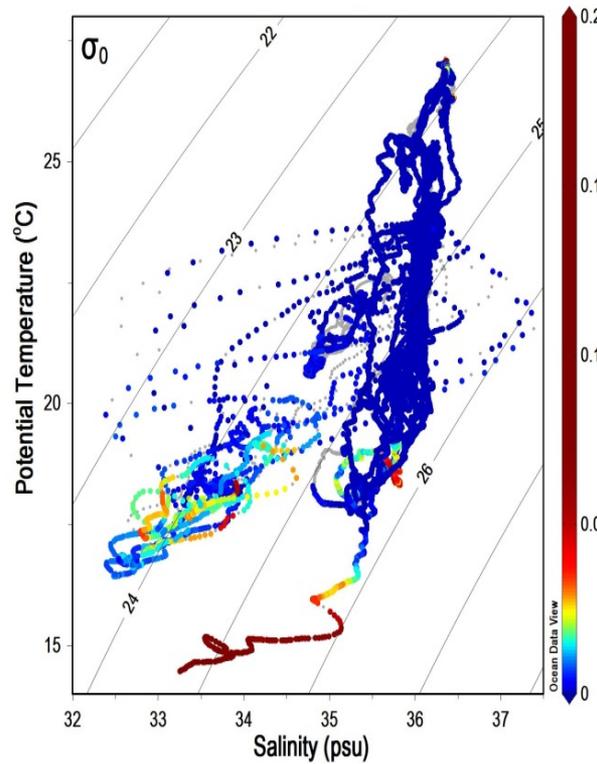


Variations in diatom biomass and photosynthetic competency of phytoplankton populations

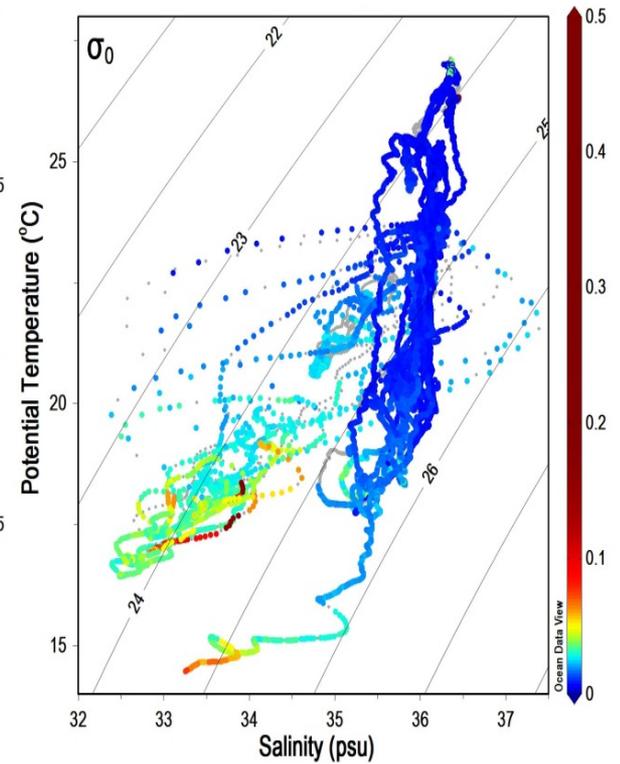
Blue water cyanobacteria



Coastal water cyanobacteria

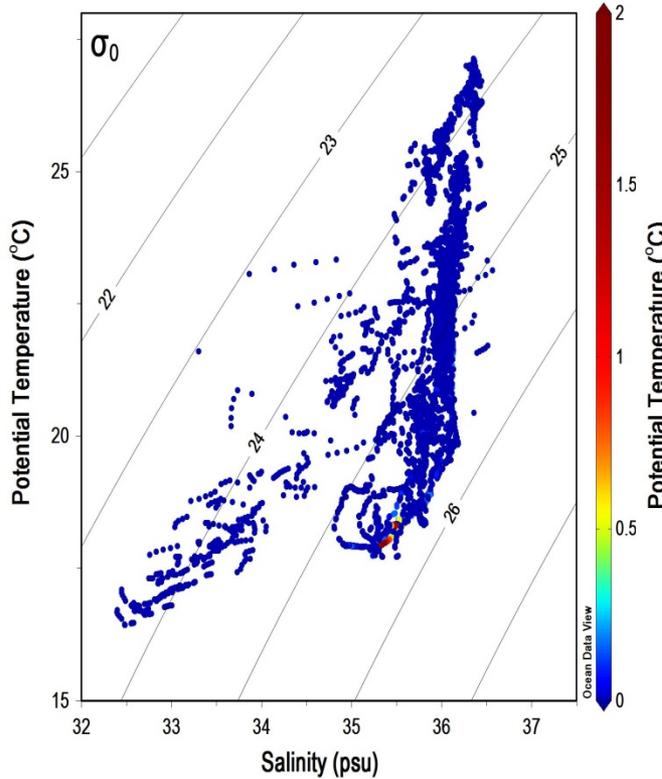


Cryptophytes

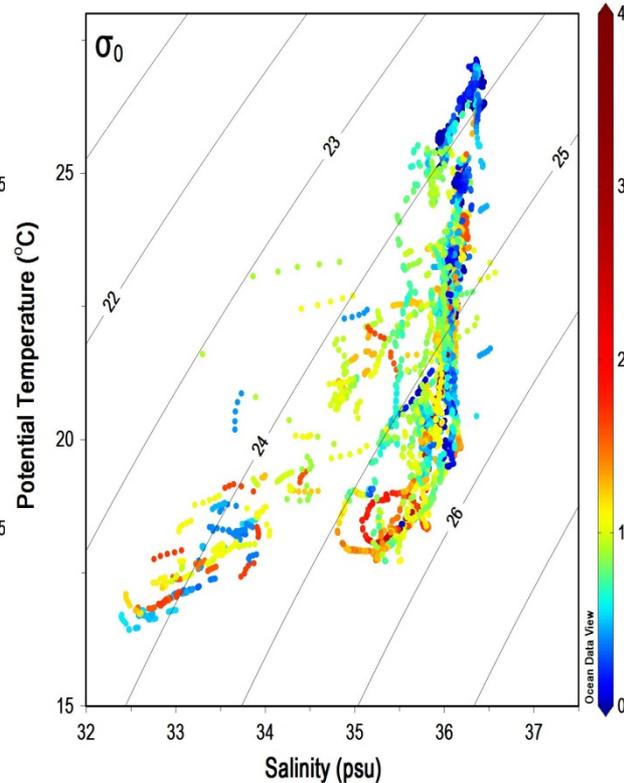


T-S plots showing PFTs associated with different water types

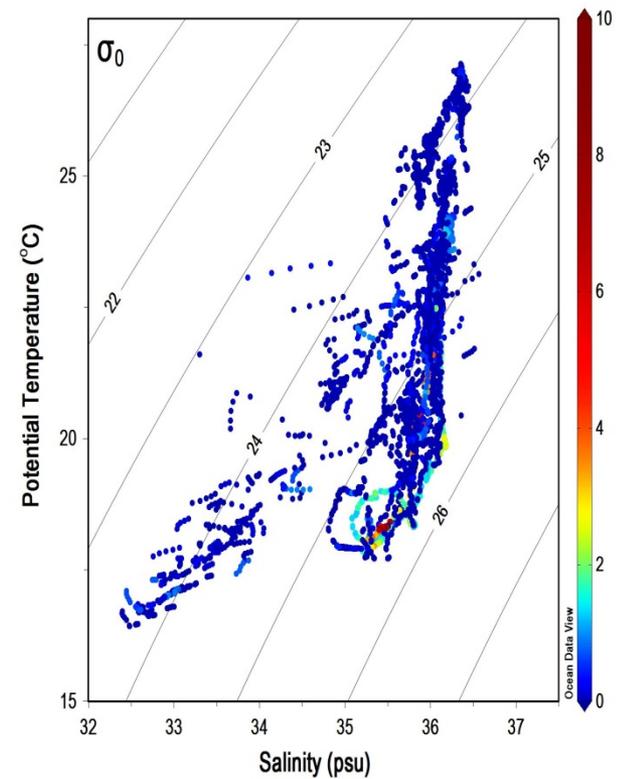
Green Algae



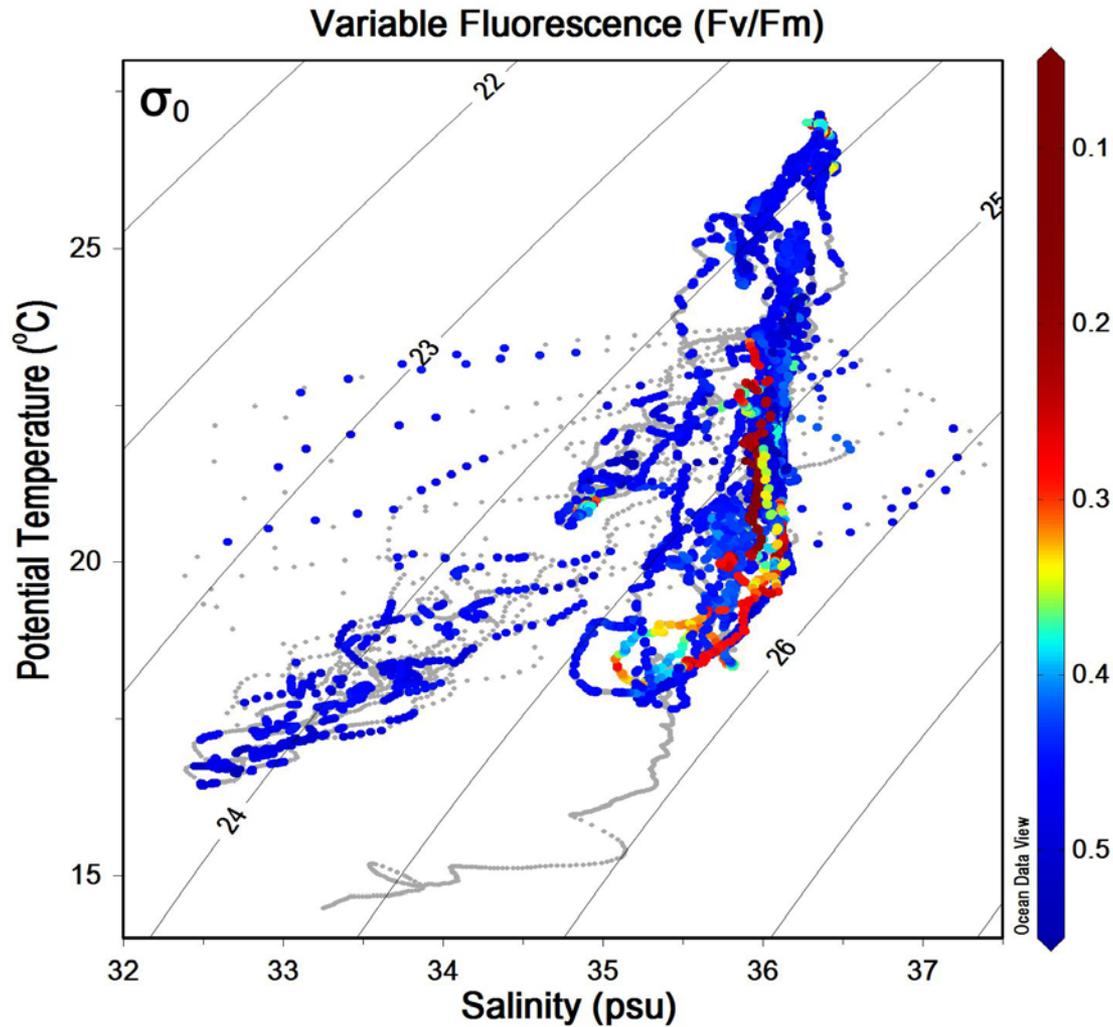
Cryptophytes



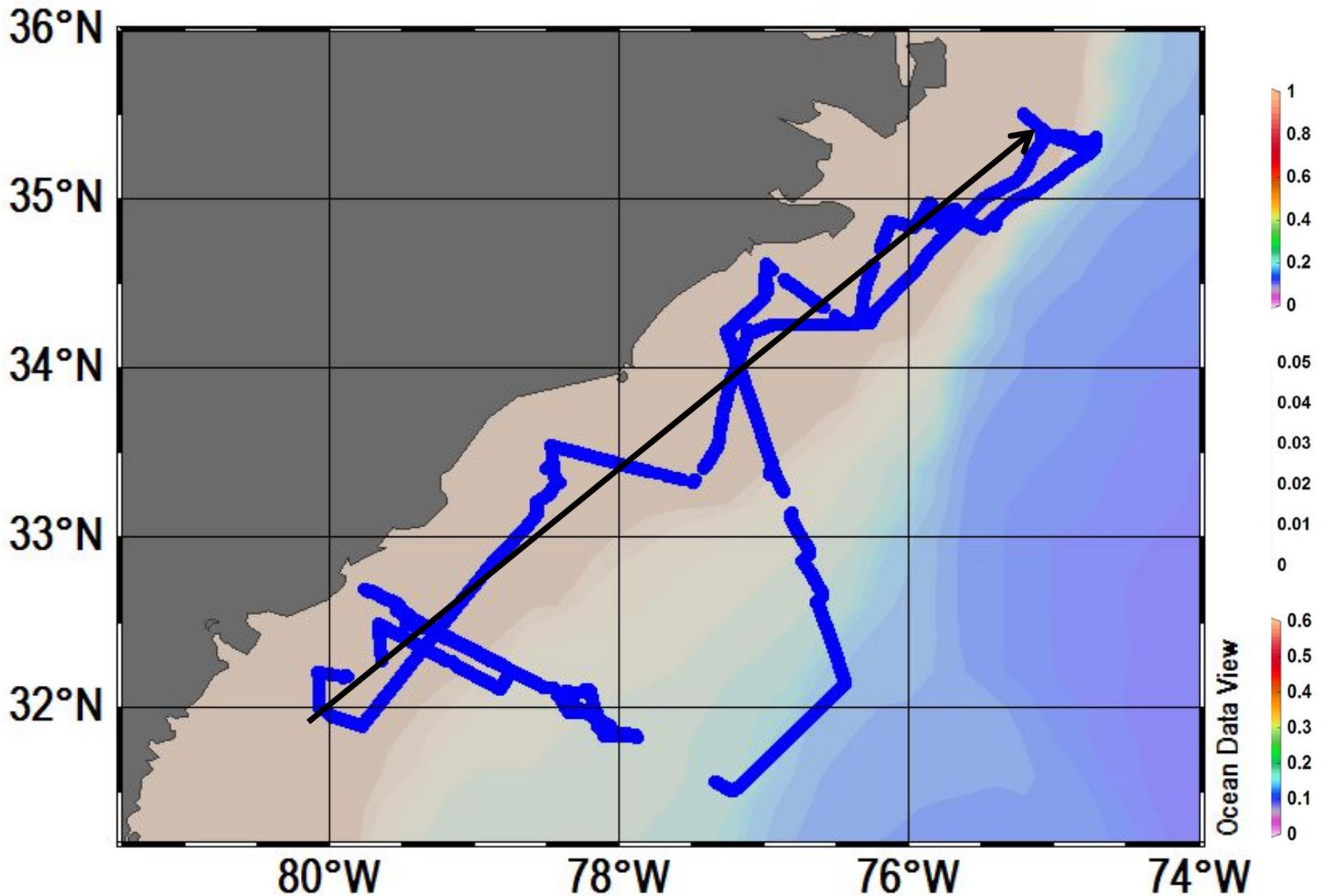
Diatoms



T-S plots showing PFTs associated with different water types

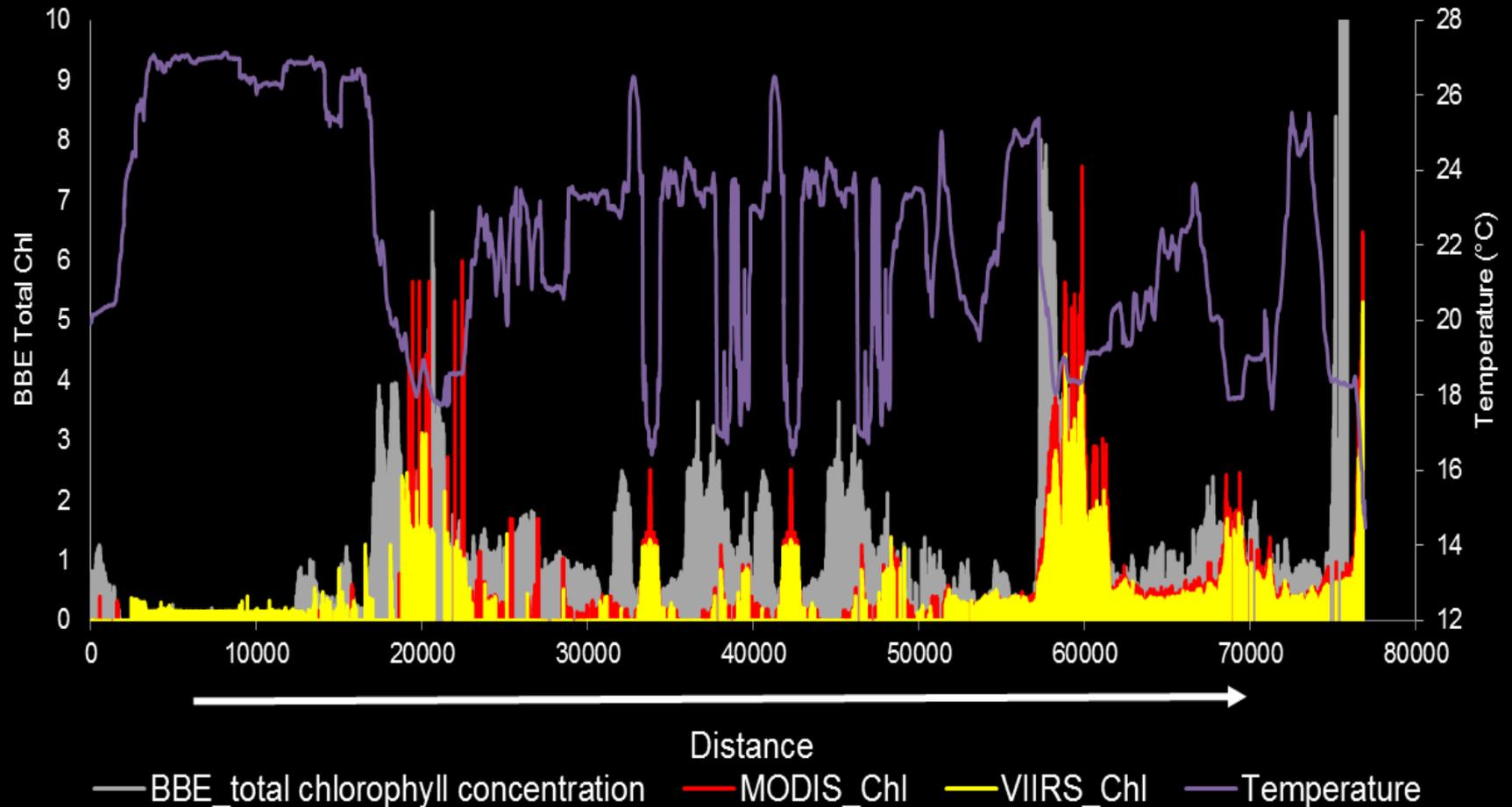


T-S plots showing photosynthetic performance of PFTs different water types



Cruise track showing N-S section from which seawater samples were drawn from different depths

Aqua MODIS, VIIRS, and BBE Chlorophyll vs Temperature



Comparison of MODIS-A and VIIRS derived Chl *a* with in-situ Chl *a* along the cruise track

FUTURE PLANS

- Development of PFT and phytoplankton size distribution algorithms using a combination of in-situ optical and hydrography measurements
- Distribution patterns of PFTs in relation to microscale features and frontal zones
- Estimation of primary productivity using measurements of phytoplankton biomass and photo-physiology

THANK YOU

