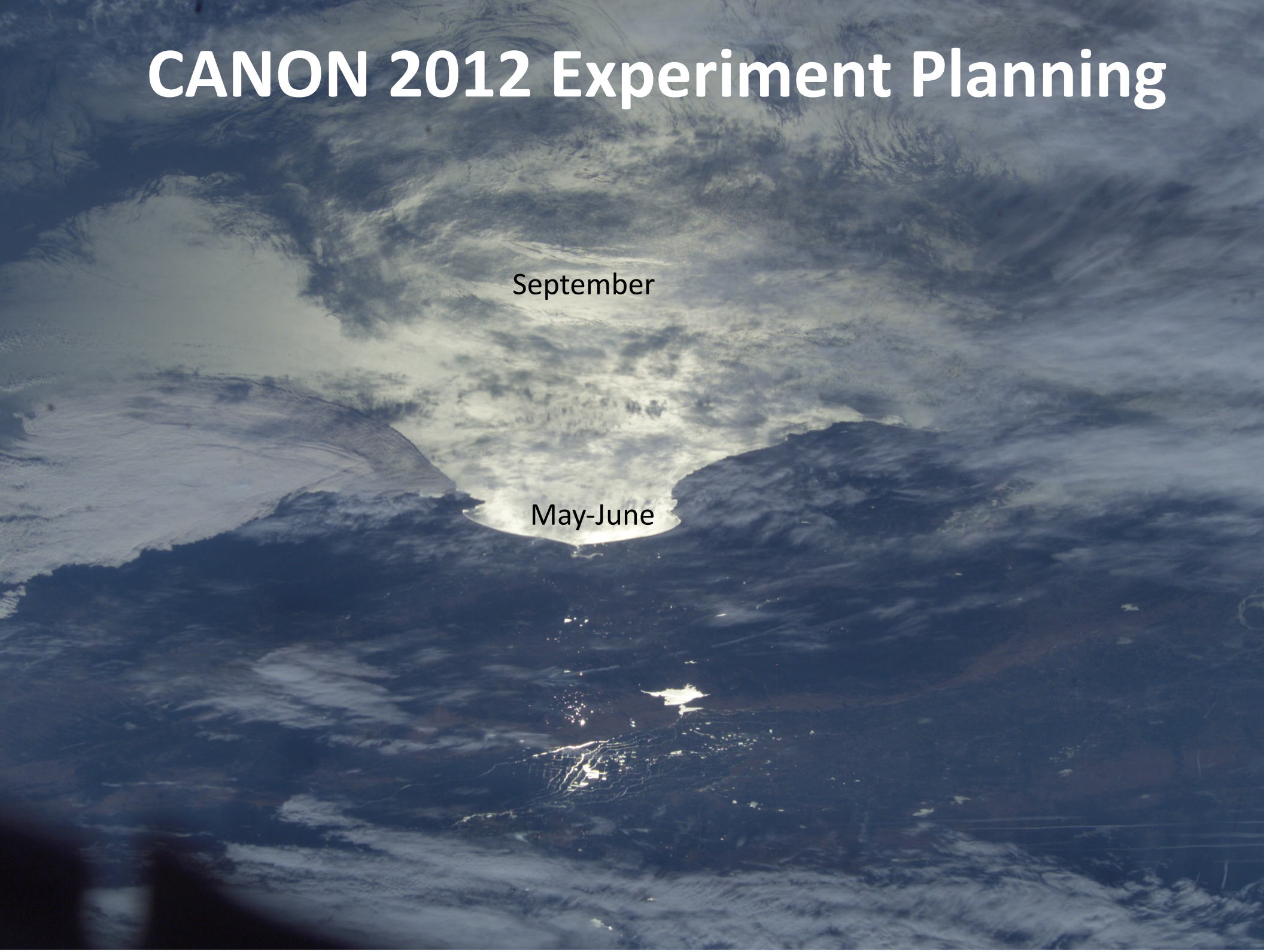
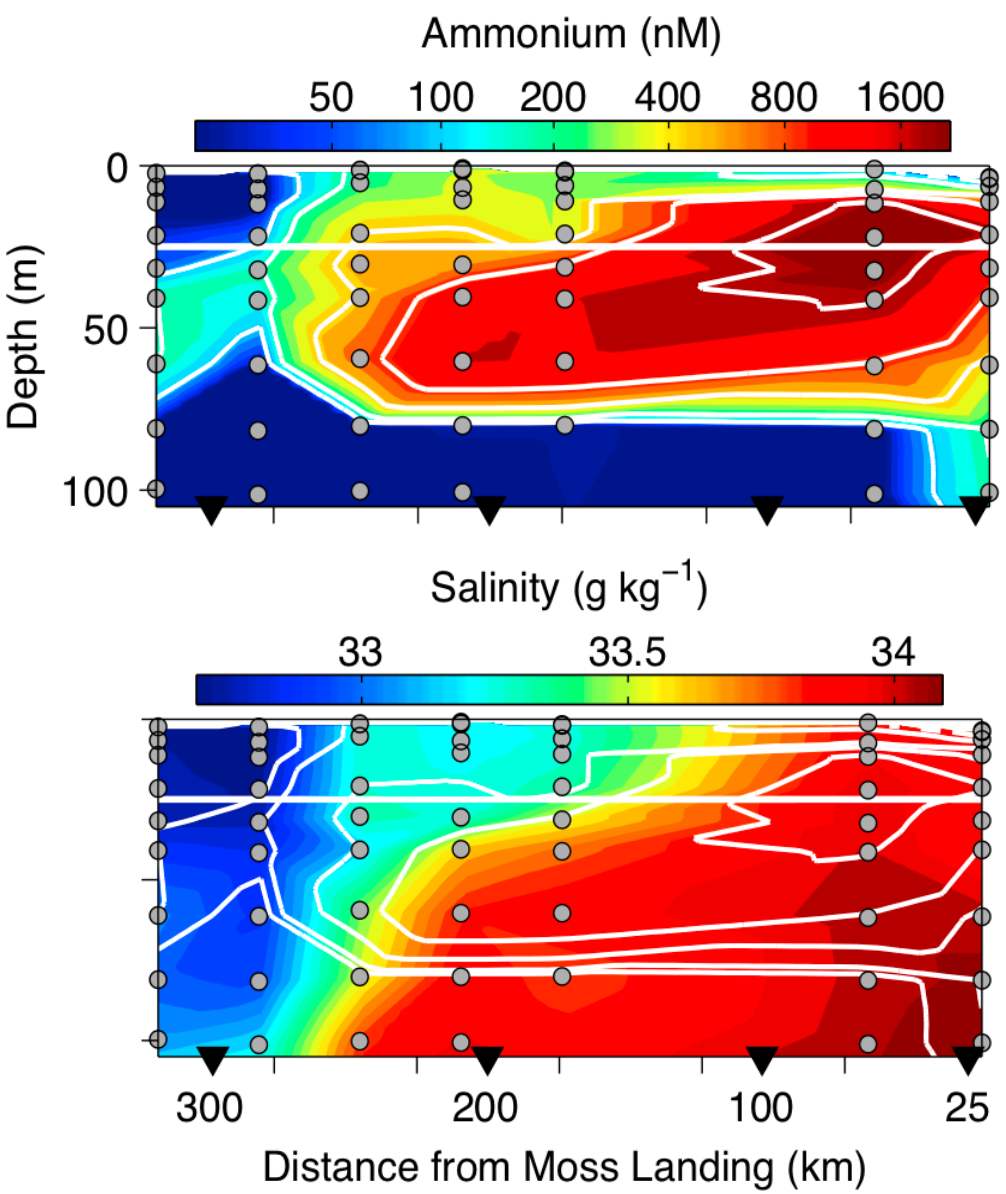
CANON 2012 Experiment Planning



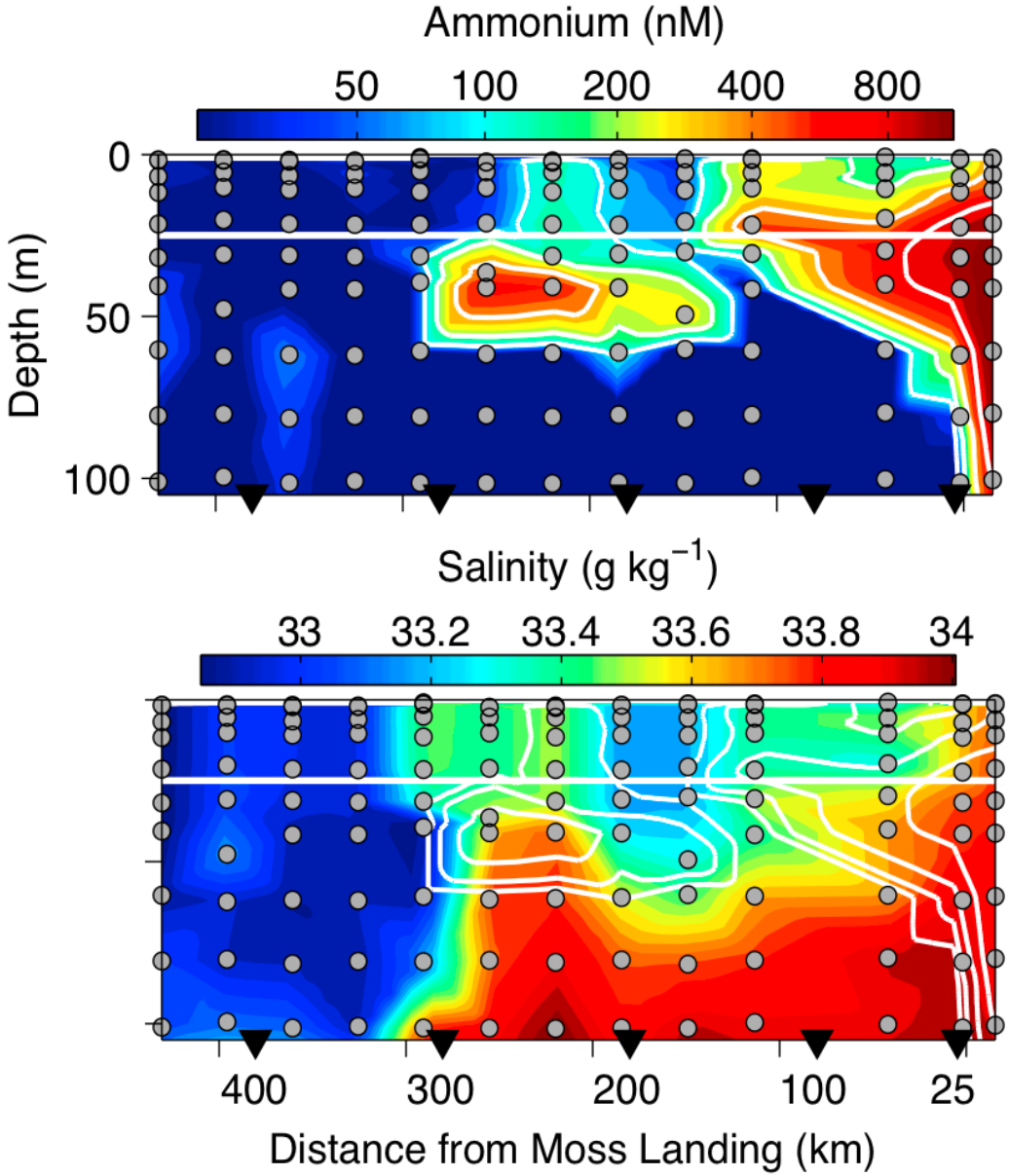
ISS009E05839

September planning: proxy for ammonium maximum?

July 2007

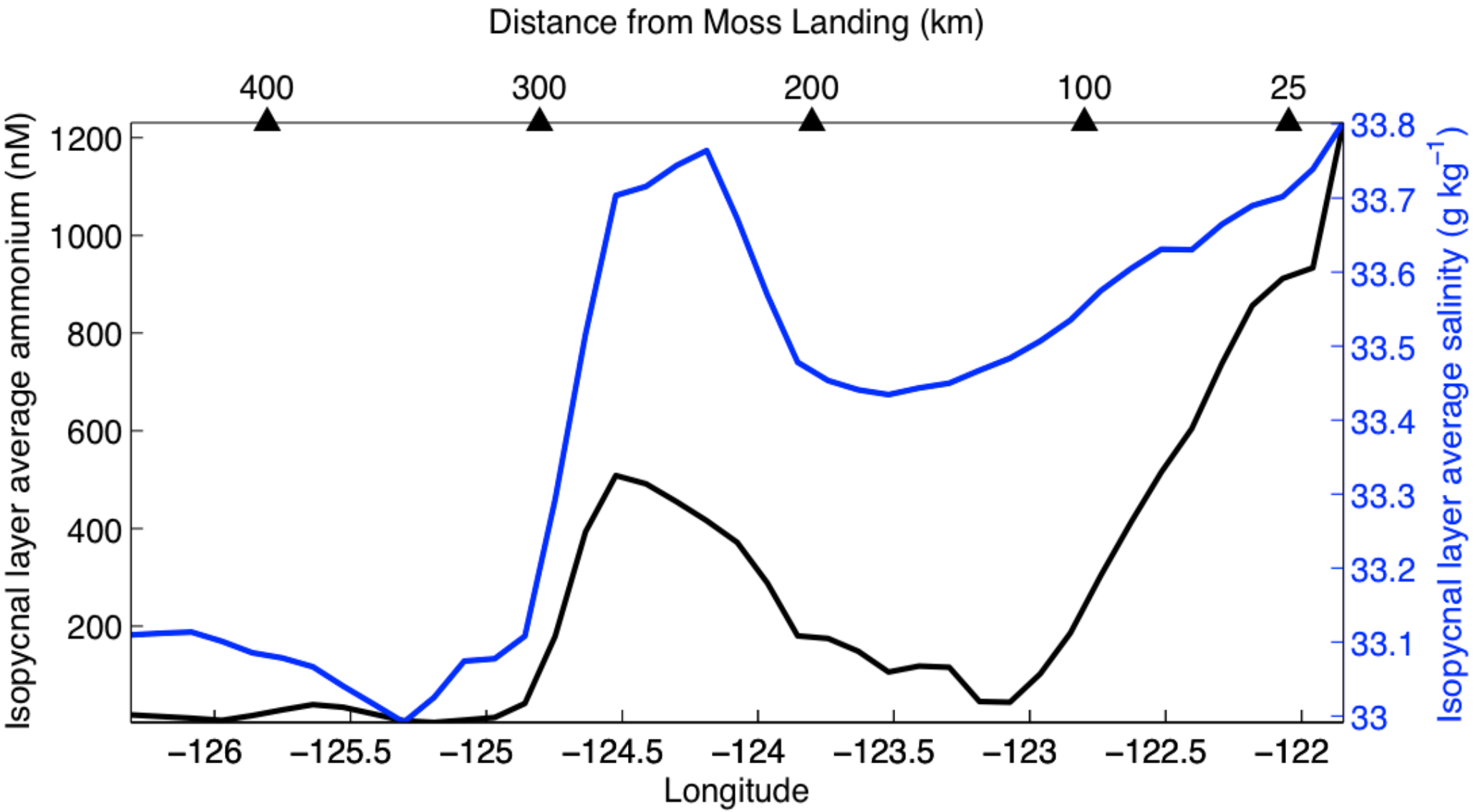


October 2007



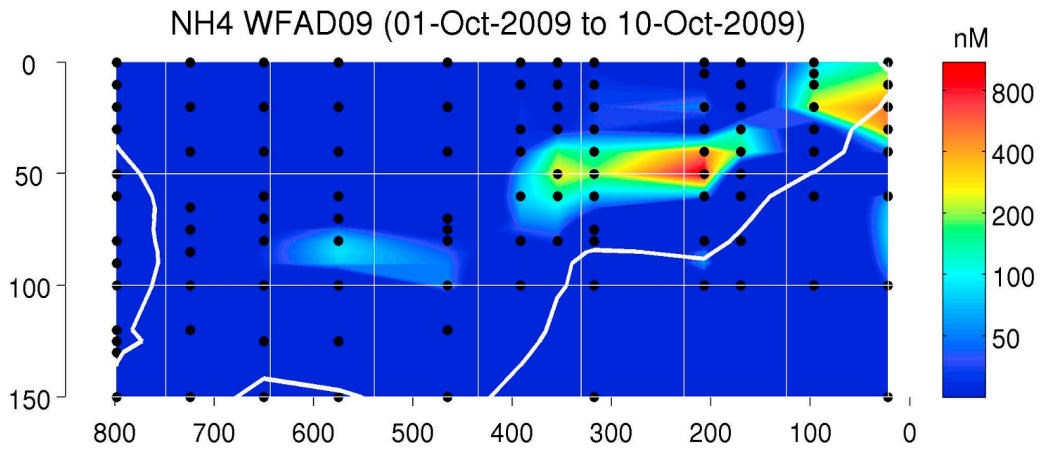
September planning: proxy for ammonium maximum?

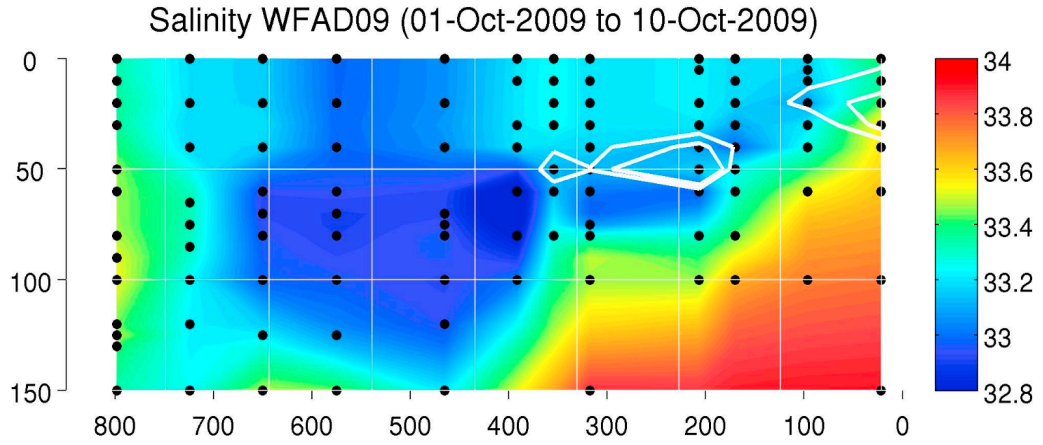
October 2007



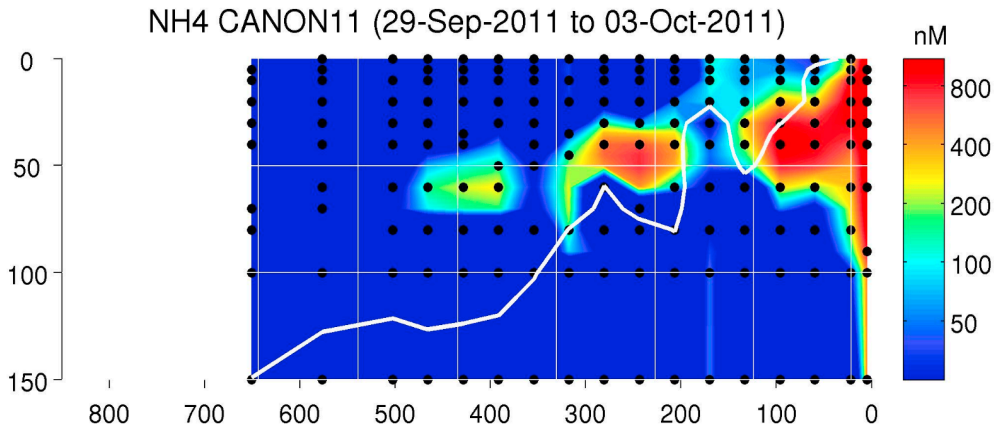
September planning: proxy for ammonium maximum?

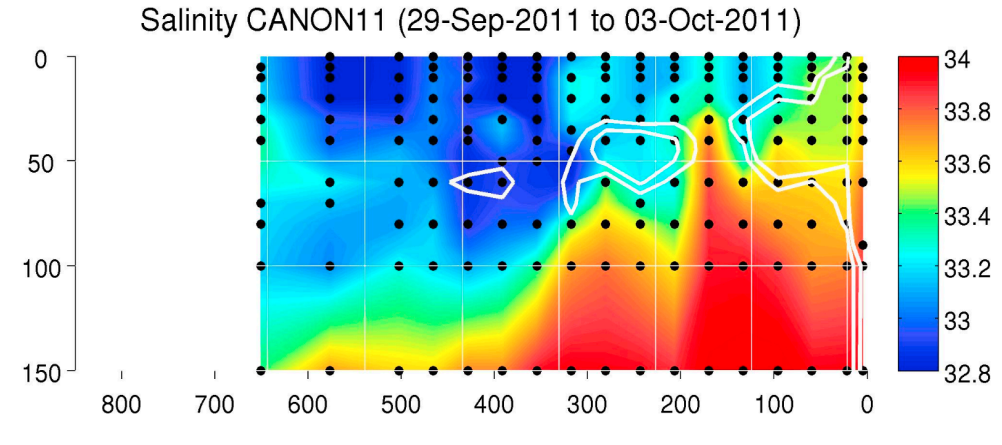
Fall 2009





Fall 2011

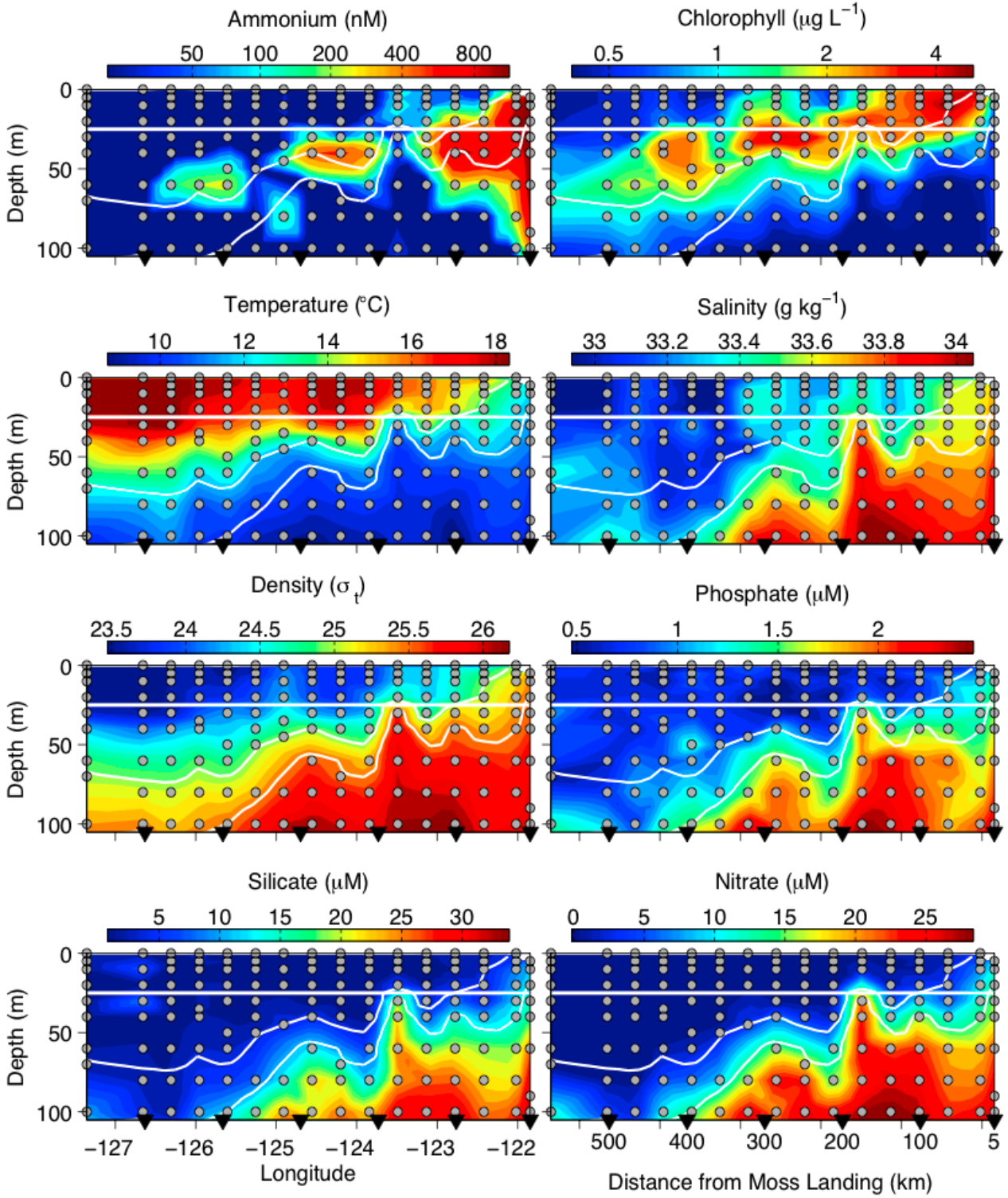




Two more cruises (thanks to Reiko and Monique.)

Better sampling in fall 2011 than fall 2009.

September planning: proxy for ammonium maximum?



Fall 2011 cruise

Considering the density layer that enveloped signal of the fall 2007 ammonium max: the same density layer captures signal of the fall 2011 max to ~150 km offshore.

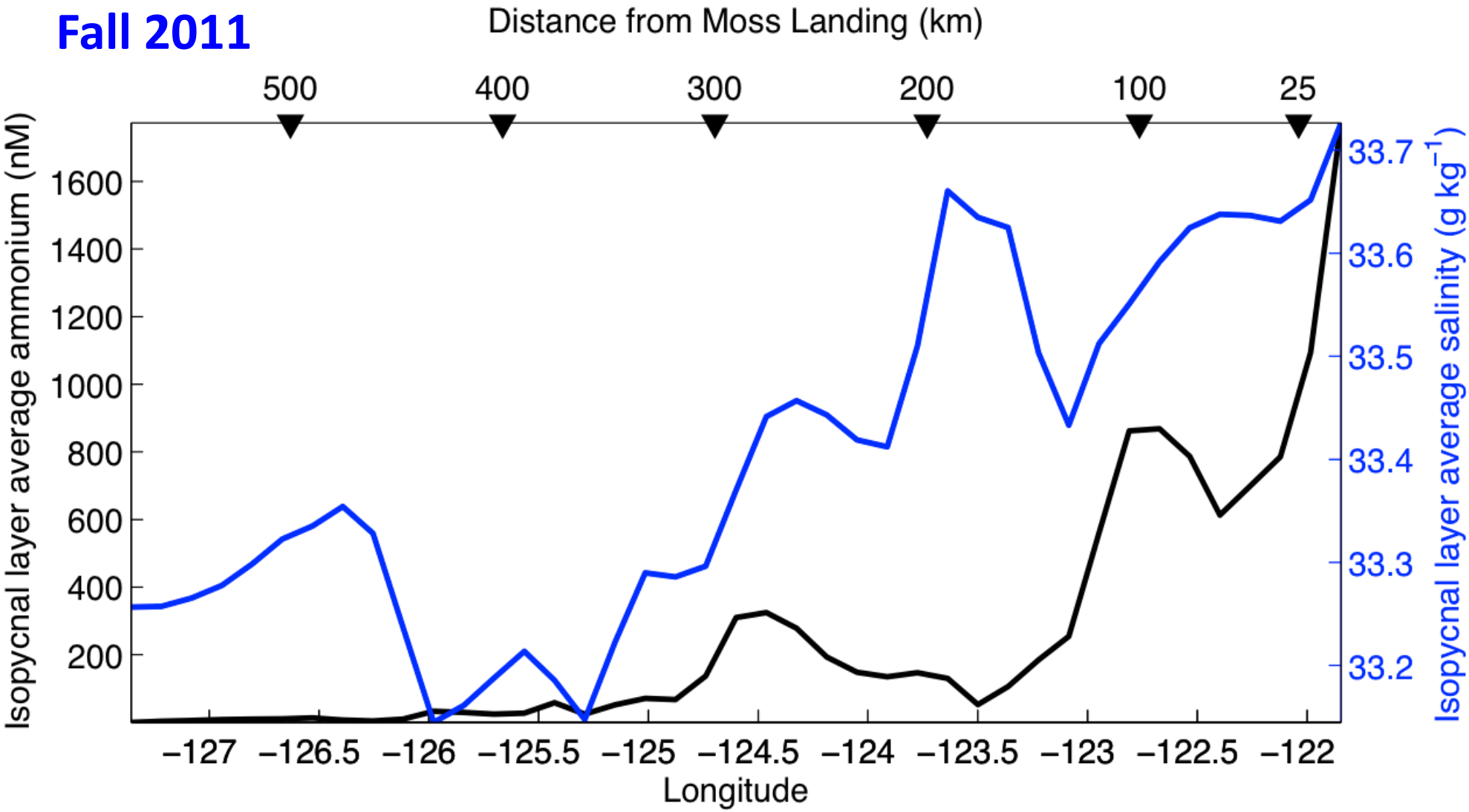
Beyond ~ 150 km offshore, the ammonium-max patches were not in the same density layer.

Indications of physical and biological control of ammonium distribution in coastal domain…

Consistent with fall 2007, ESP @ 25 m would sample the upper ammonium max well, to ~150 km offshore. Same for fall 2009.
→ Cable length choice.

September planning: proxy for ammonium maximum?

Fall 2011

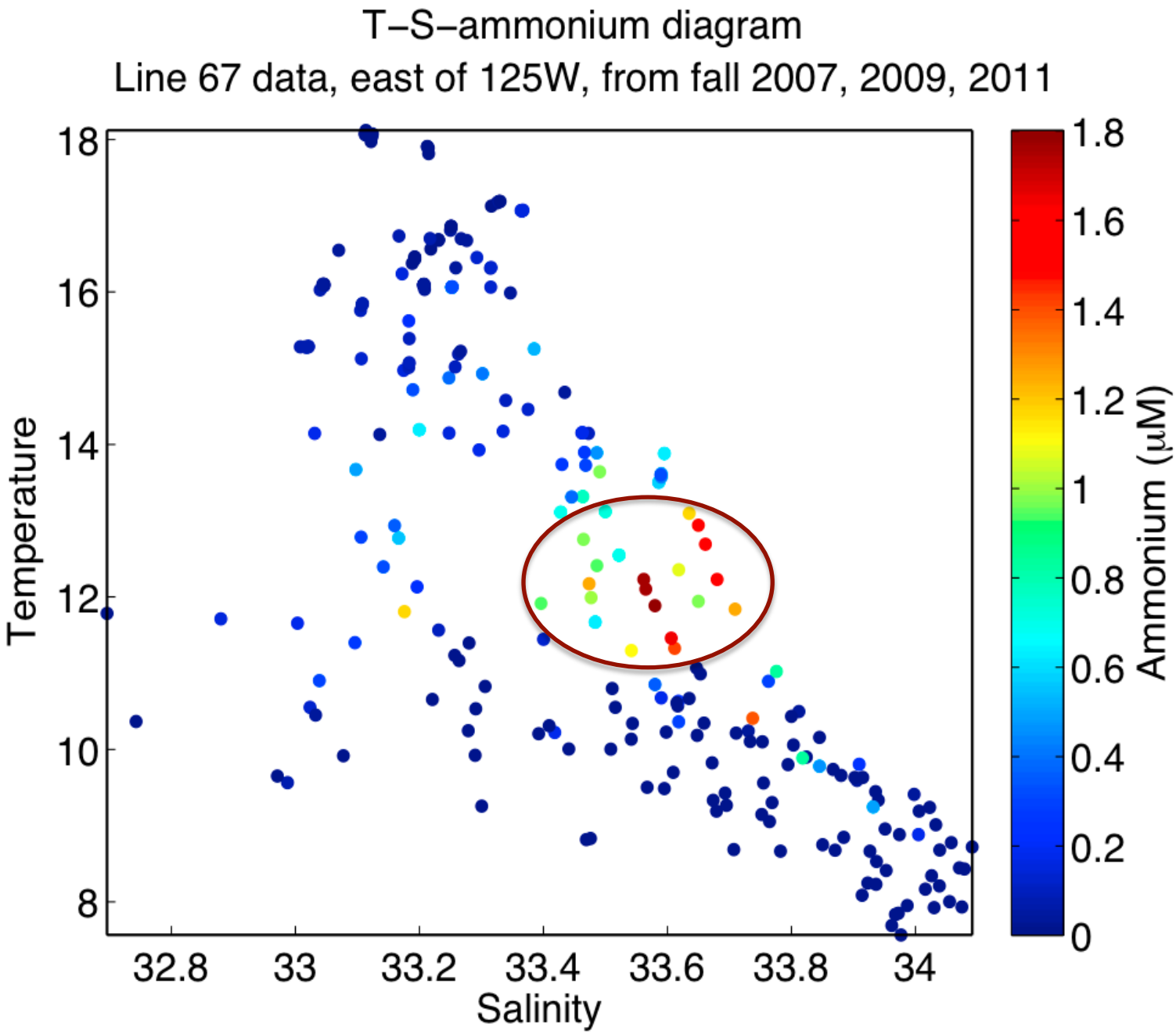


* Tuning density range for this cruise does not help.

Density-layer salinity is NOT a consistent / effective proxy for NH4 max:

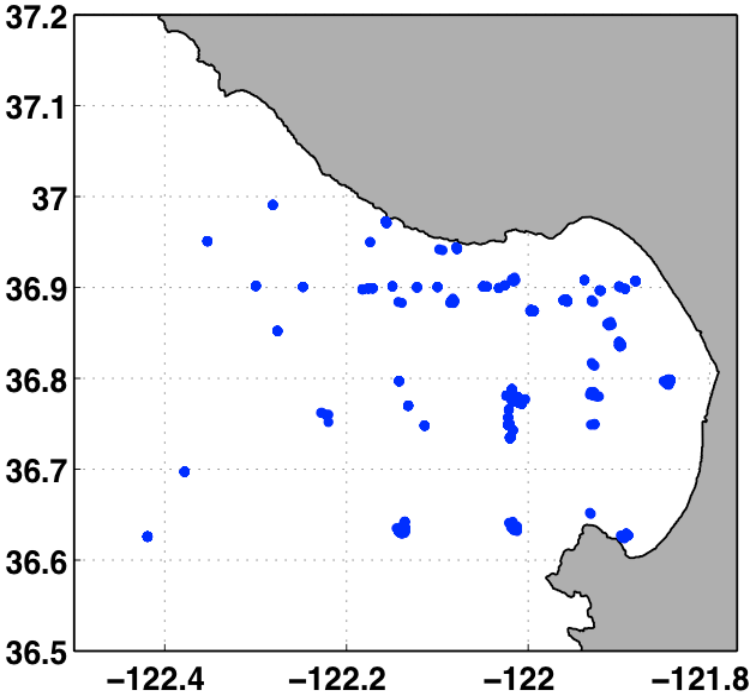
- **Density range of ammonium max not consistent spatially or temporally**
- **No consistent relationship between salinity and ammonium**

Alternate proxy?



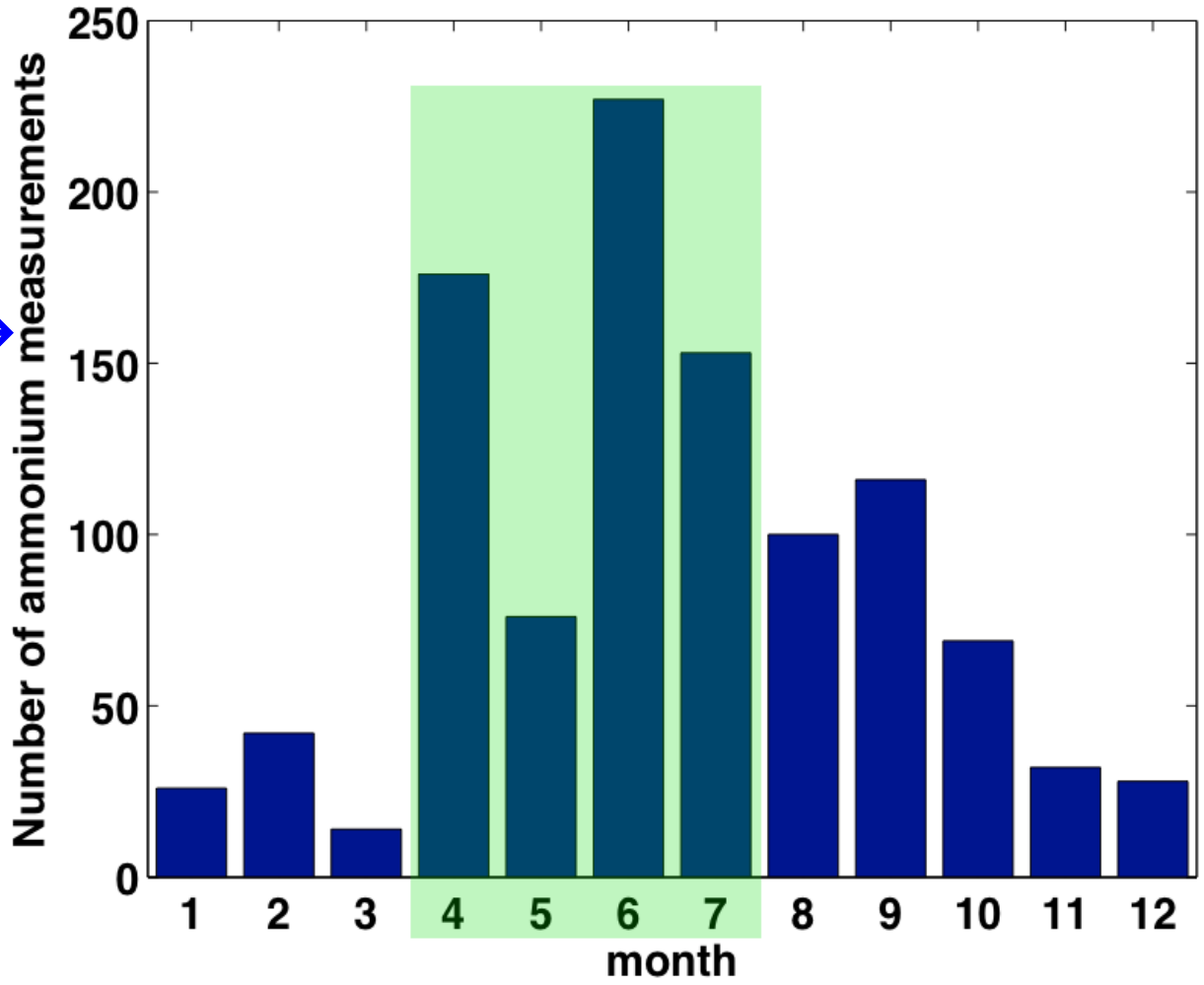
Check multivariate prediction with all "real-time" measurements from LRAUV, e.g. plus nitrate, oxygen…?

May – June planning: analysis of ammonium profile data

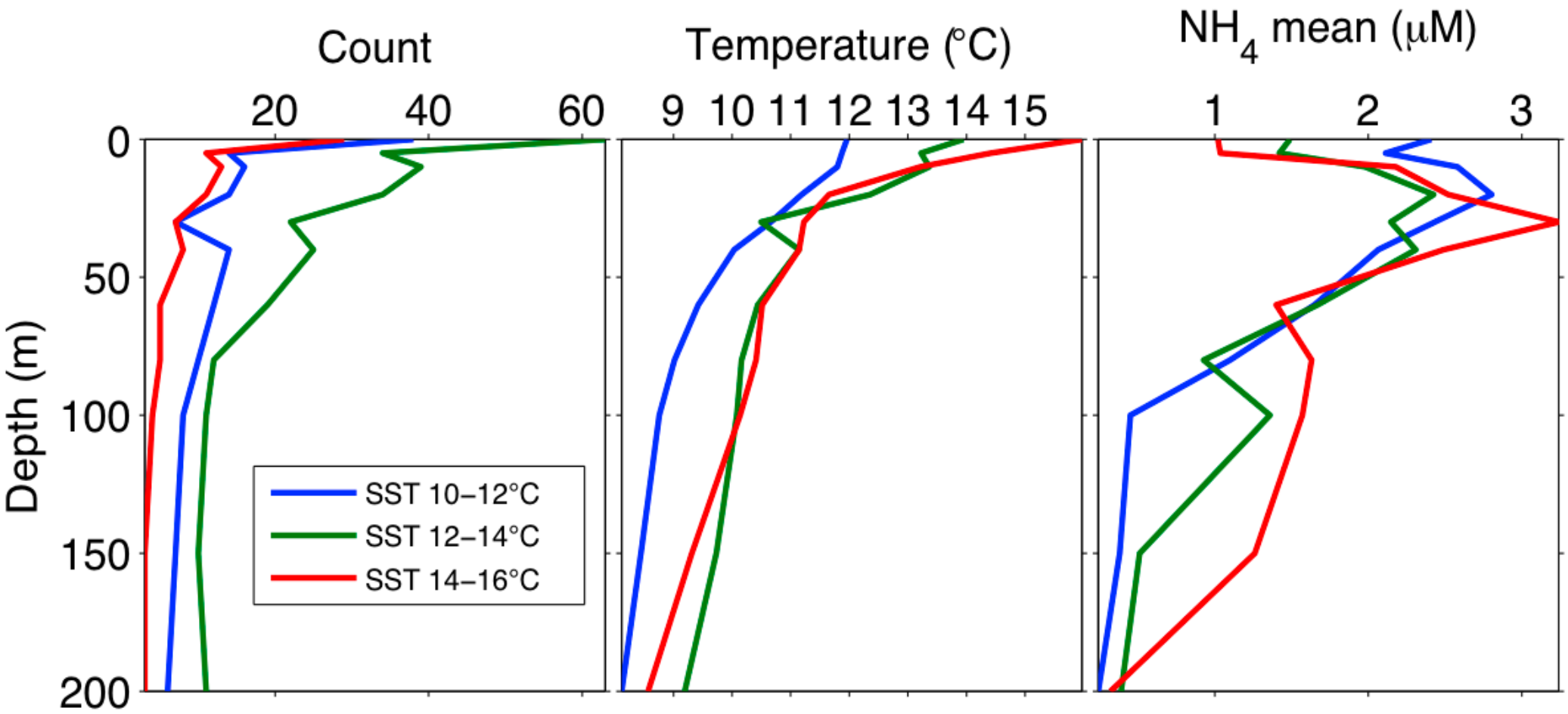


Not number of profiles →

Statistics: April through July →



May – June planning: analysis of ammonium profile data

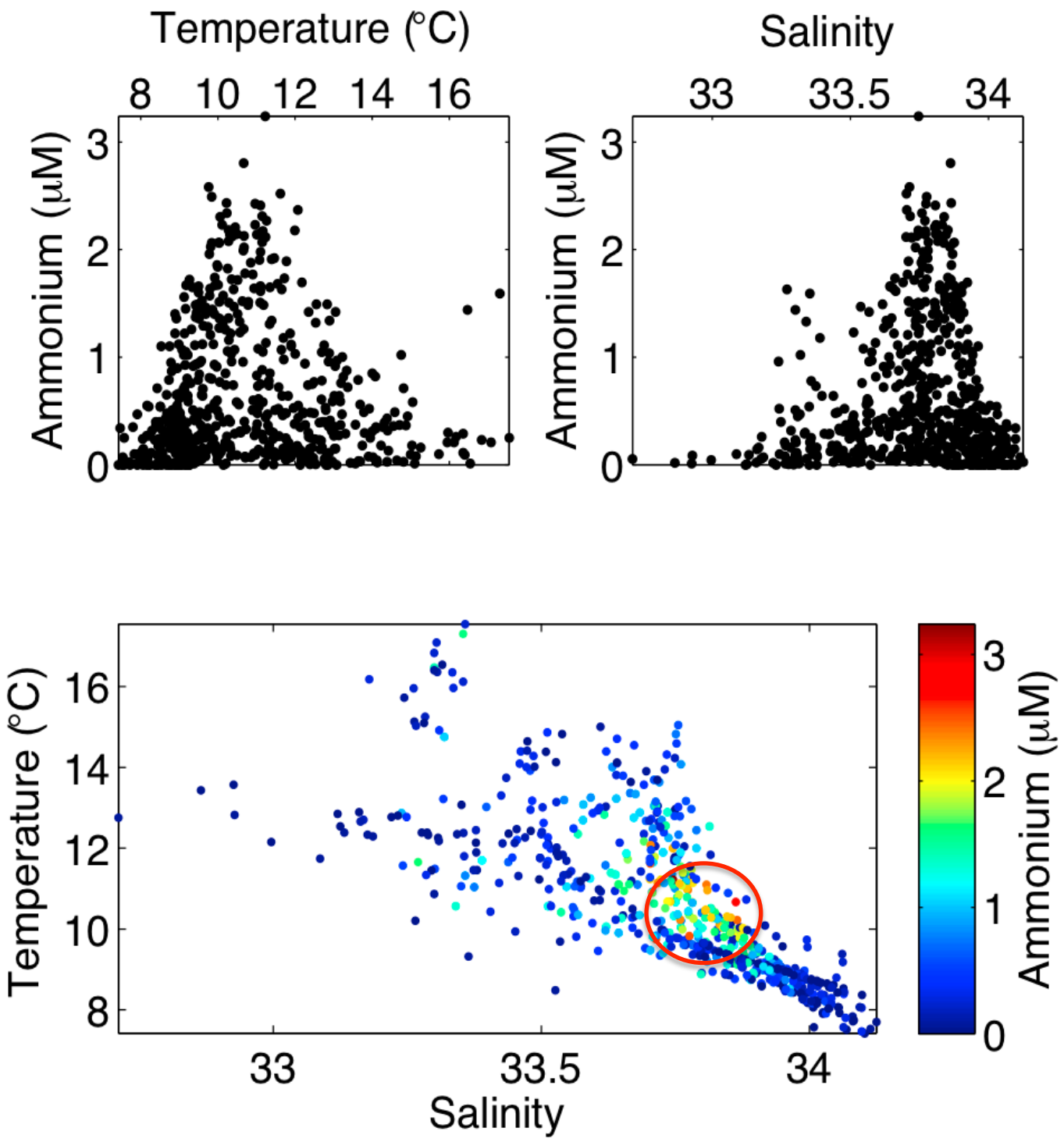


✧ Geographic binning was not ideal - considering low-density coverage & goal of relating patterns more closely to a proxy for upwelling history → SST binning.

✧ Results suggest that with increasing SST (rough-proxy for stratification / aging):

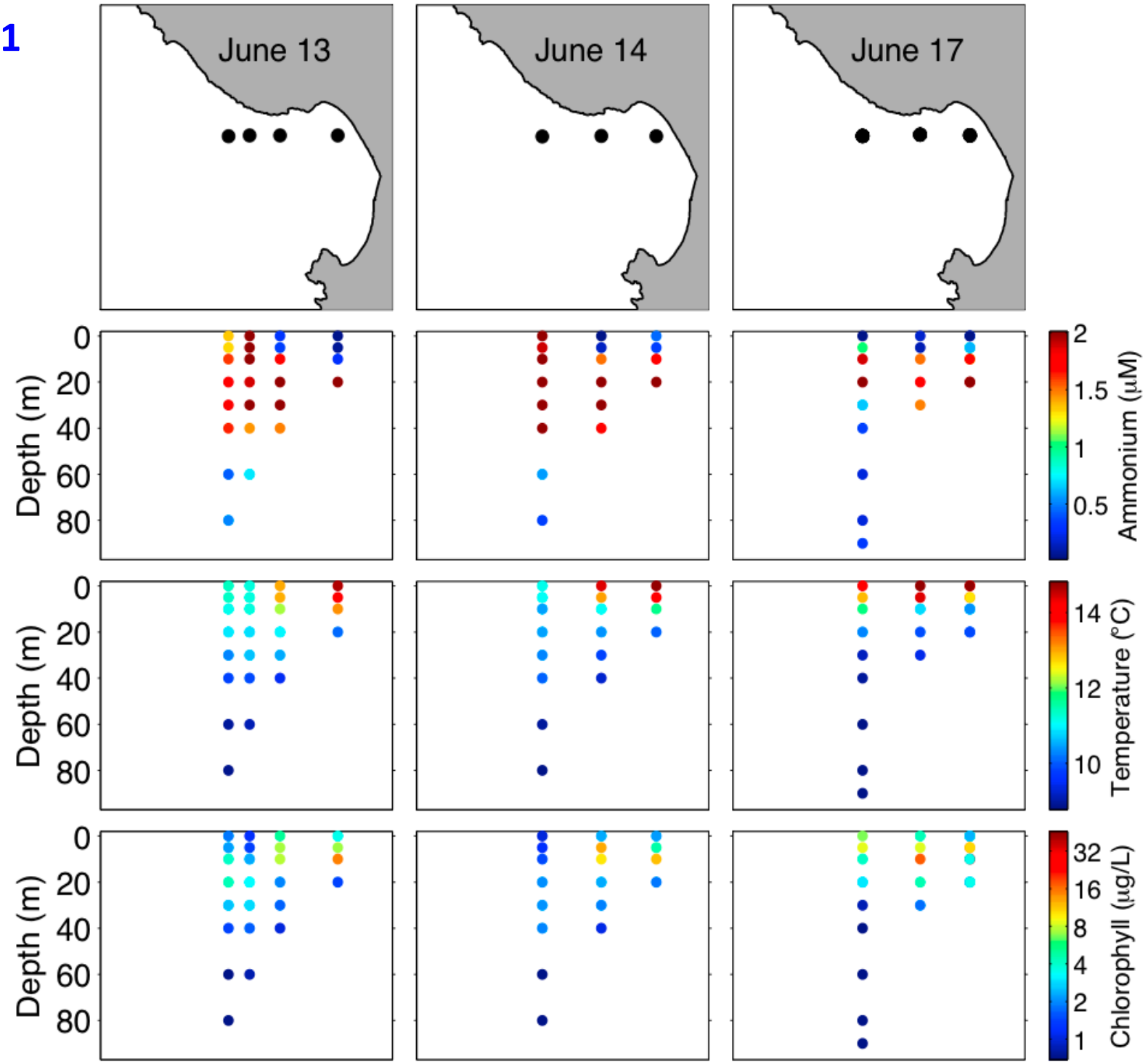
- ✧ Lower ammonium at the surface, consistent with uptake
- ✧ Higher ammonium in the subsurface maximum (in warmest bin), consistent with production (Is n high enough to be confident?)

May – June planning: analysis of ammonium profile data



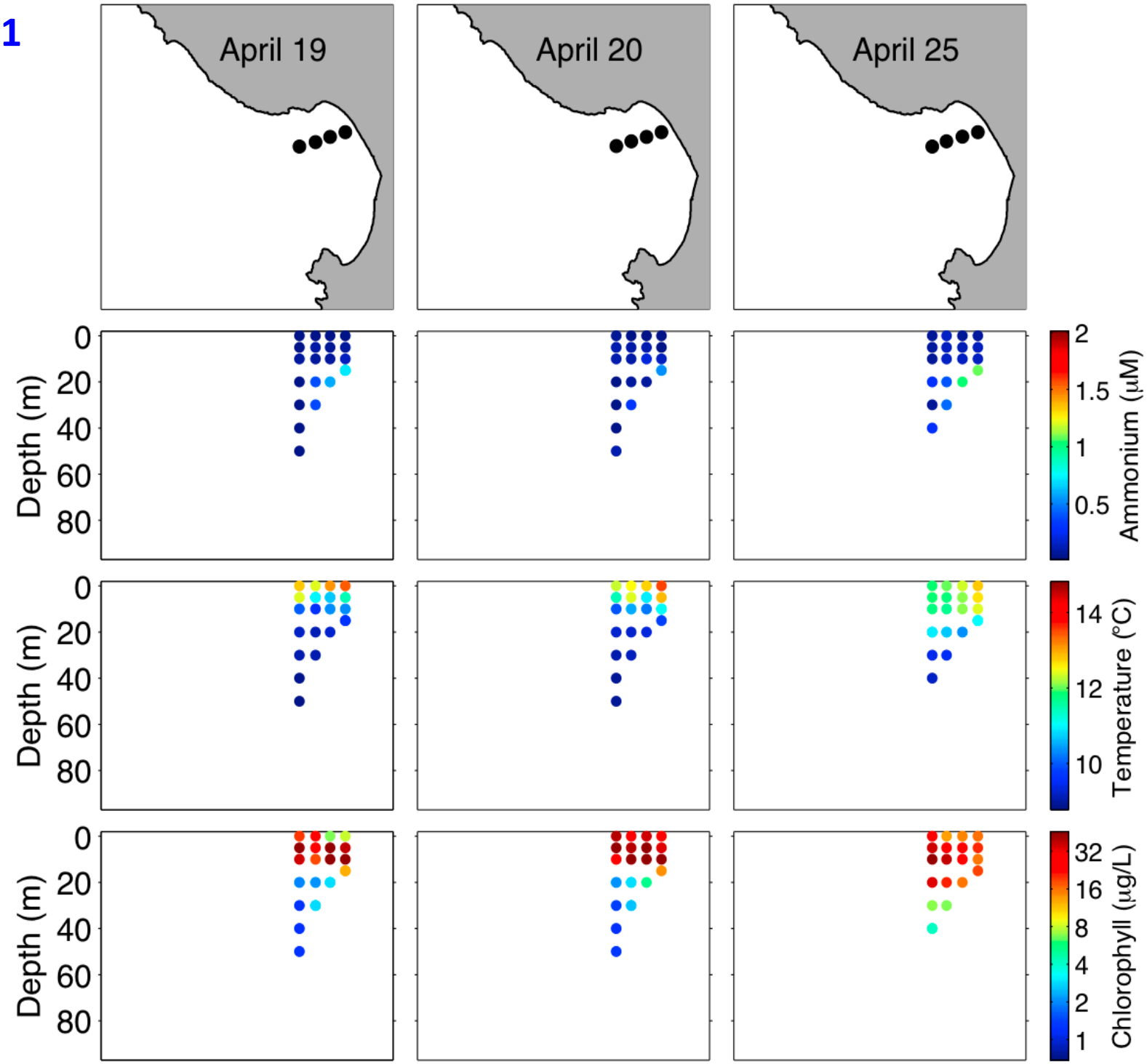
Cross-frontal distributions of ammonium (Jason Smith)

June 2011



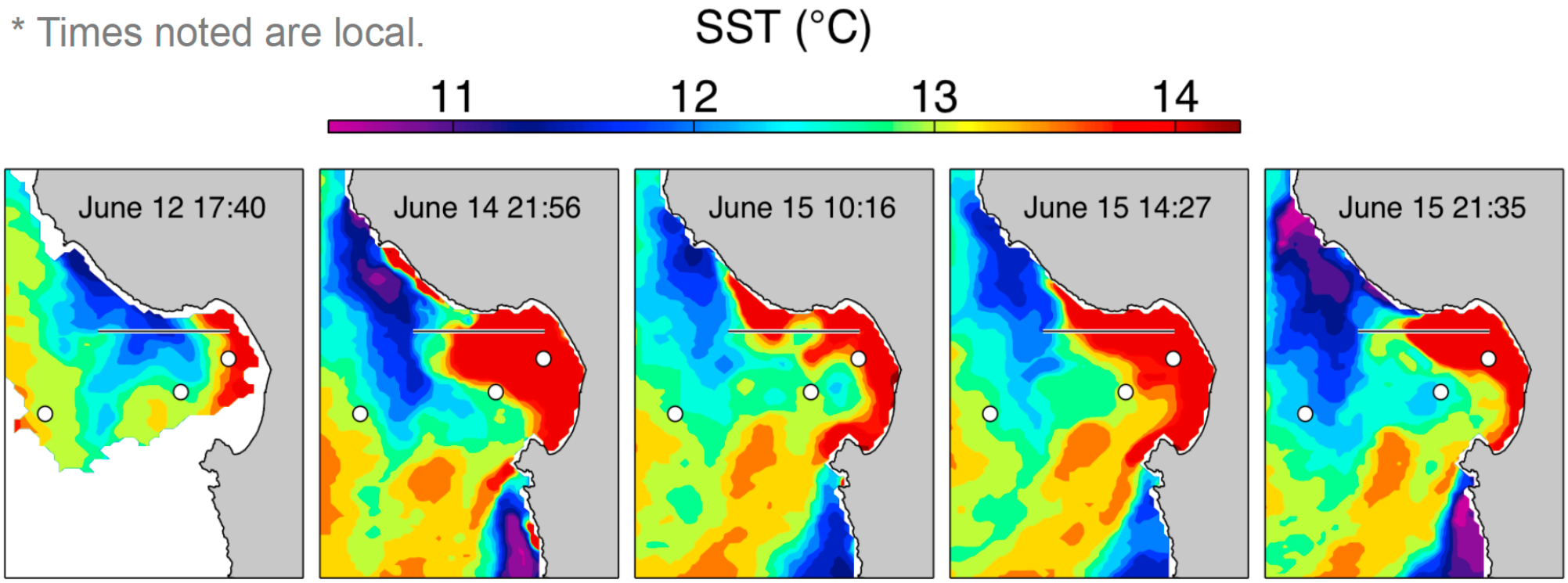
Cross-frontal distributions of ammonium (Jason Smith)

April 2011



Chl really this high?

Rapid variation and signal strength



Distributions of water types and fronts change rapidly → need for AUV onboard intelligence / recognition / response

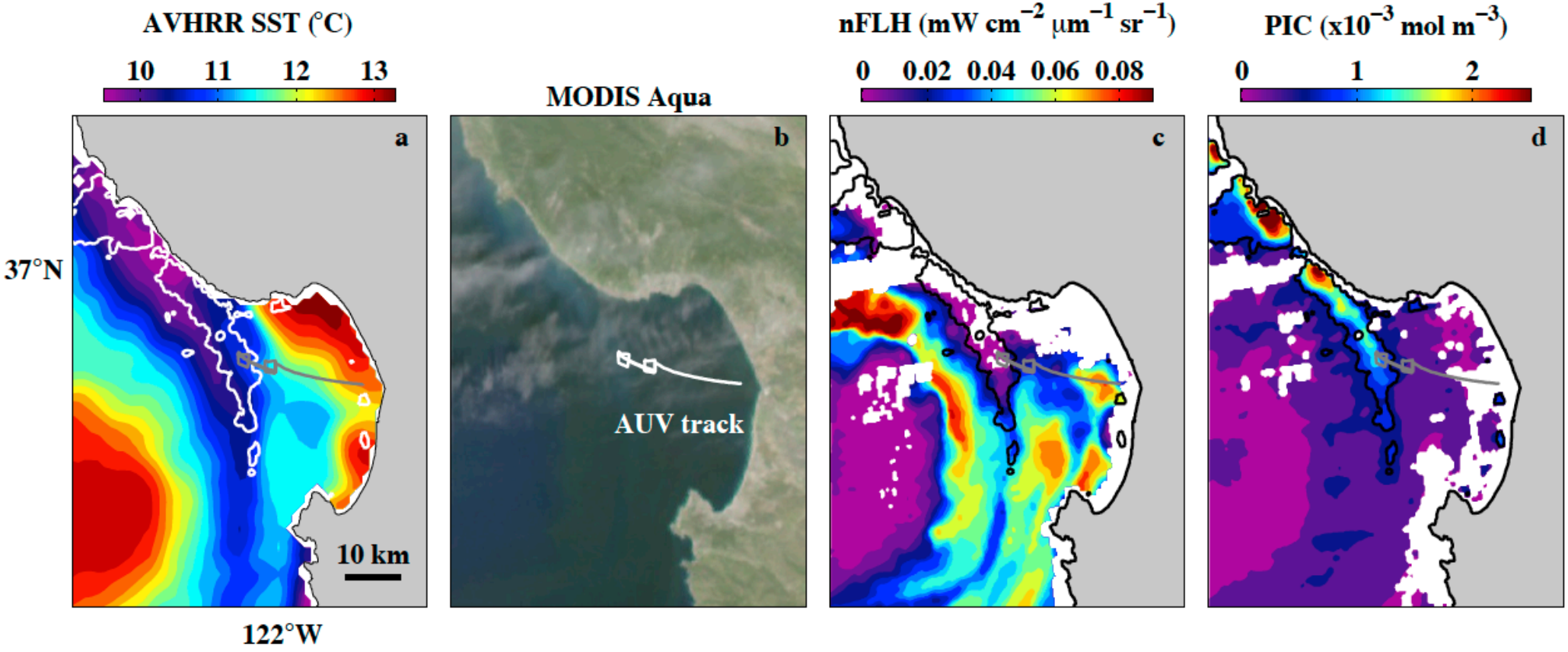
Motivation to focus effort where the signals are likely to be strongest.

But wait, there's more…

"Shift-up" data set
(Dugdale, Wilkerson, Chavez et al.)
data in BOG, analysis to be done…

Upwelling filaments as ecosystem process integrators

[CANON April 2011 Experiment: Tethys leads Dorado in robot ballet.]

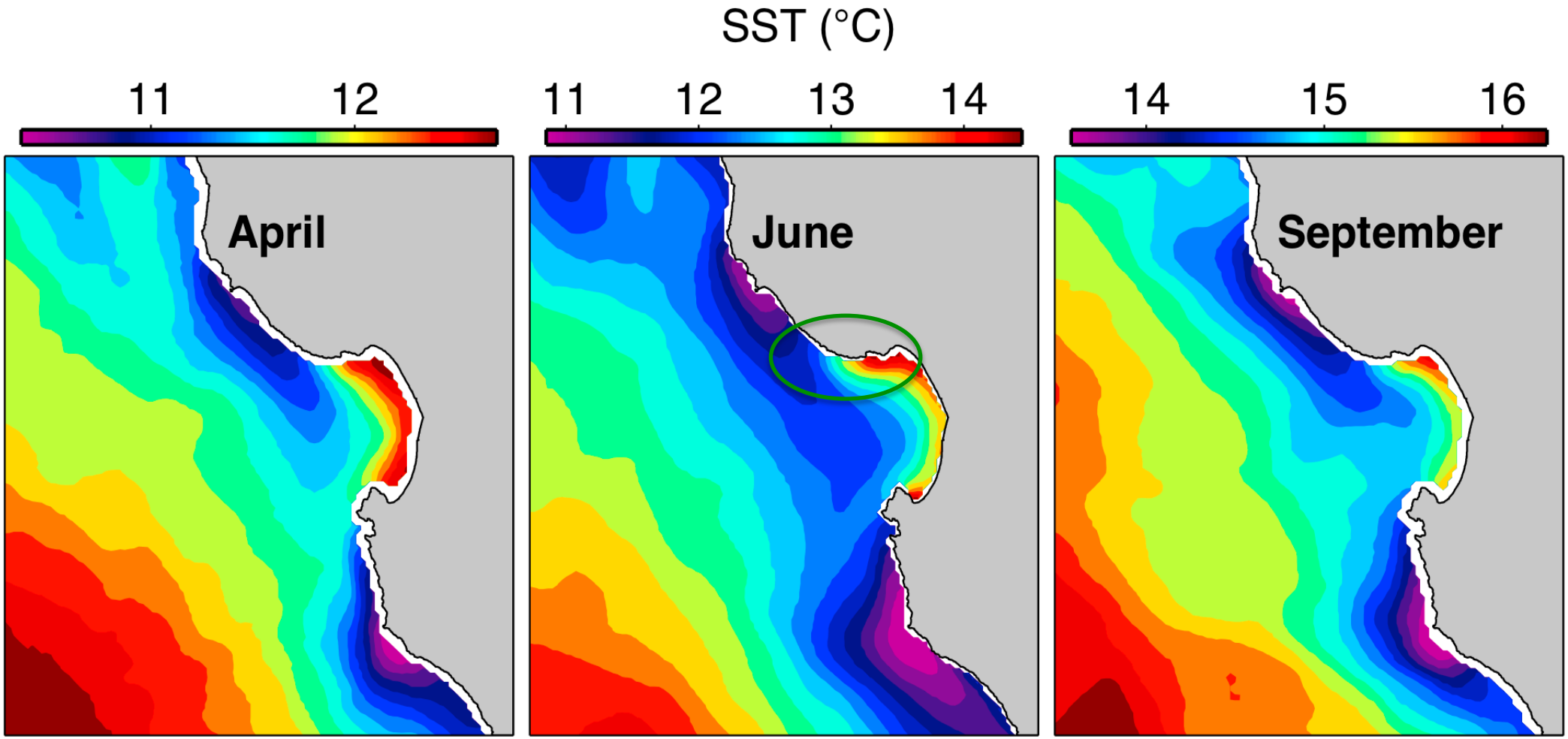


- ❖ Supply of nutrients, including *ventilation* of subsurface ammonium maximum → phytoplankton productivity
- ❖ Zooplankton aggregation → ammonium production (nutrient recycling)
- ❖ Transport of sediments, with consequences for phyto / zoo ecology.
- ❖ Establishment of primary ecosystem physical / chemical structure and processes.

Coastal eutrophic questions

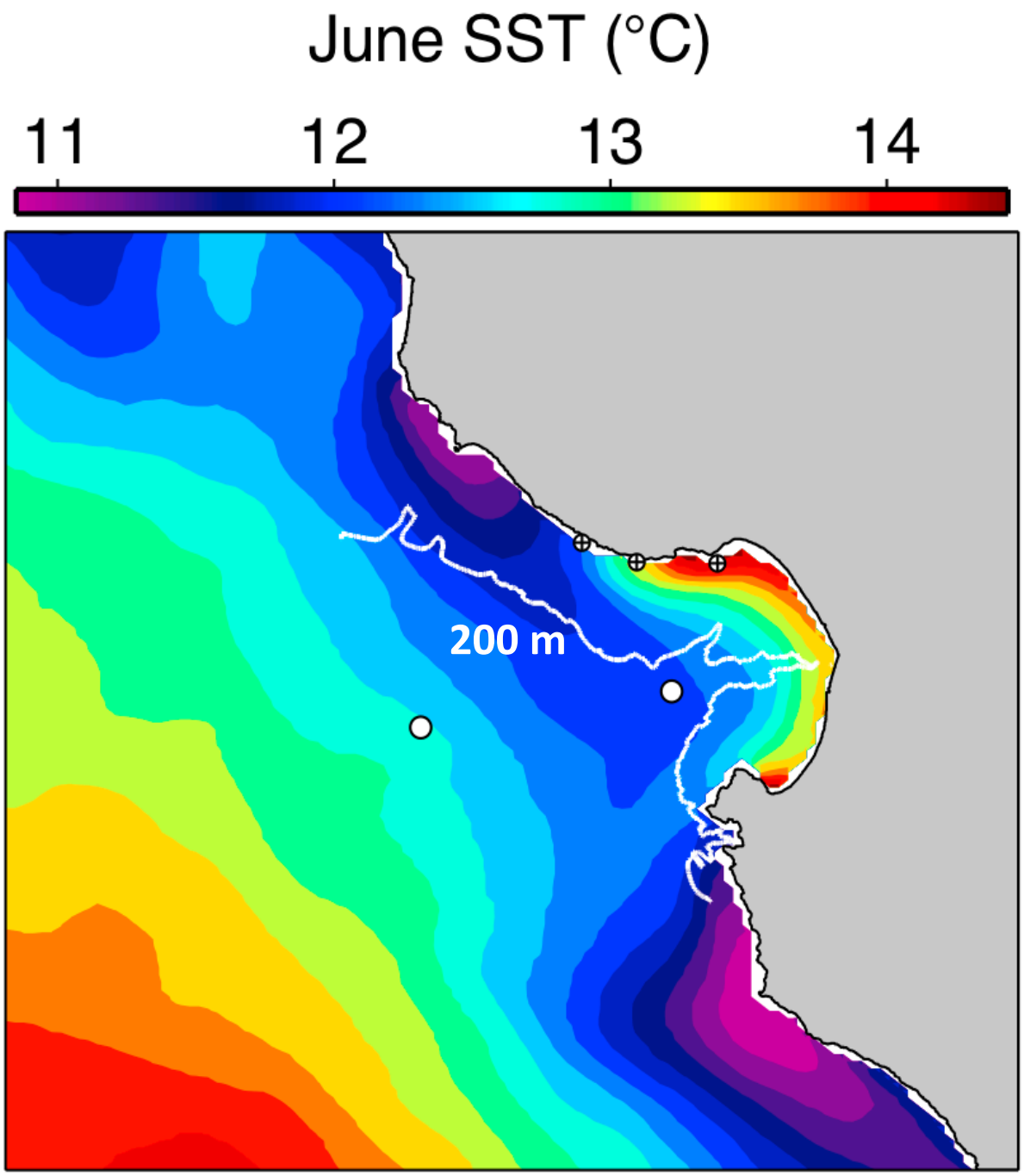
- Can we detect increased levels of zooplankton at the edges of the upwelling plume?
- Can we measure diel changes in ammonia at the edges of the upwelling plume?
- Can we measure diel changes in the nitrogen cycle at the edges of the upwelling plume?
- Can we quantify nutrient fluxes from the upwelling plume into the high chlorophyll waters?
- Does high ammonia in upwelling plume inhibit diatom growth?

Focus effort where the signals are likely to be strongest.



Rotation and compression of upwelling shadow, relative to April.

Hay Plan (straw is not nutritious)



Reconnaissance phase:

✧ environmental status for plan adaptations

✧ inform subsequent operations with ship and Dorado (including parameterization of autonomous water type / front recognition).

LRAUV volume survey(s) across northern shelf and upwelling filament zone.

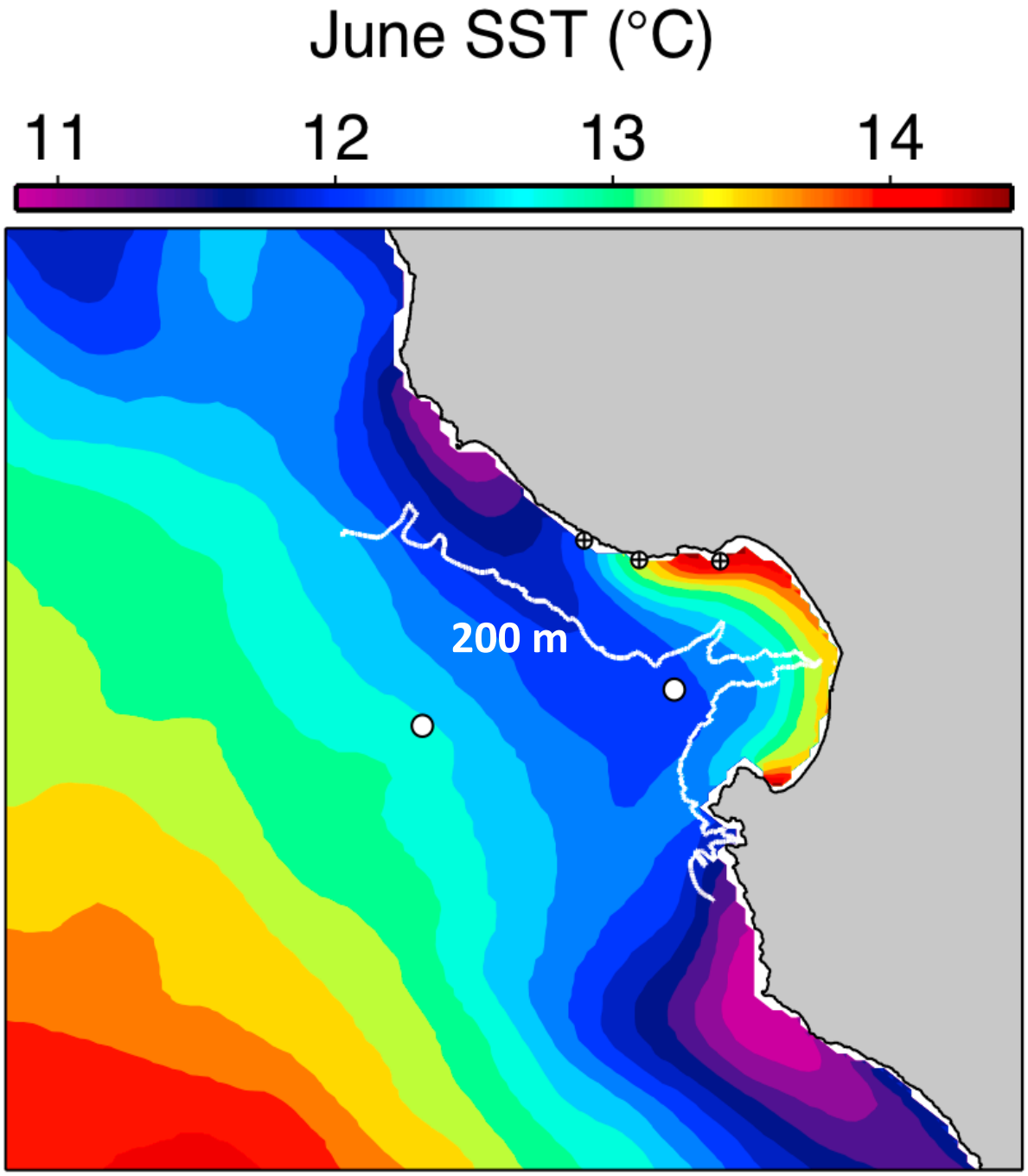
Maintain sections with Webb and Spray gliders (depth dependence).

Wave Glider grid across the upwelling / shadow complex.

Satellite remote sensing (as visibility permits).

Rajan lab testing.

Hay Plan (straw is not nutritious)



Full-up (starting May 21):

LRAUV maintain volume survey(s) or move to application of its more advanced algorithms:

✧Frontal high-resolution mapping

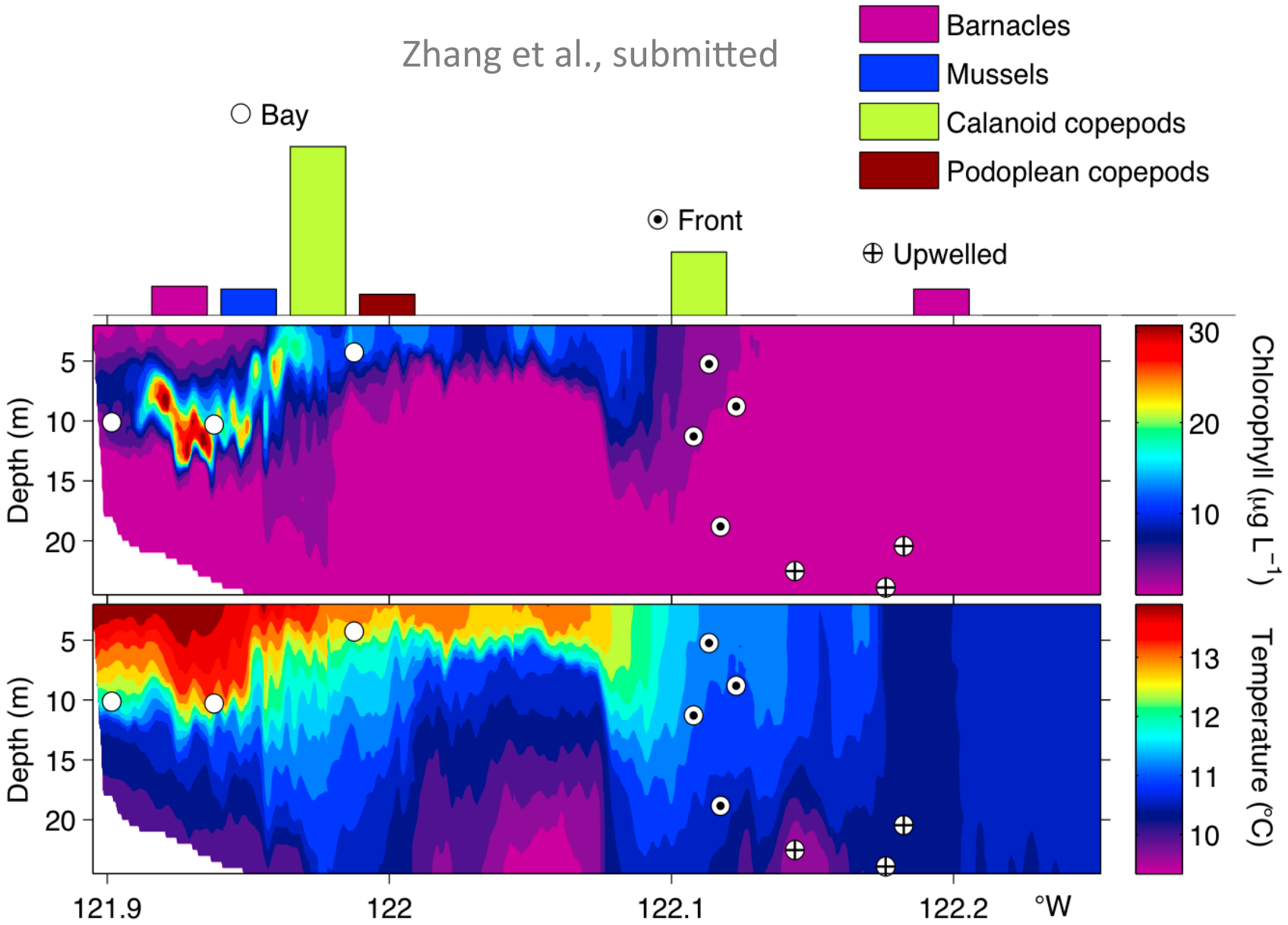
✧Drifting to define Lagrangian pathways

Maintain Webb and Spray glider sections and Wave Glider grid.

Martin day operations: Use underway system to intelligently target sampling similarly to Dorado?

Dorado: surgical sampling of water types and front.

Surgical Sampling with Dorado



*** This time, Dorado will acquire samples during the onshore leg, to acquire biological / biogeochemical samples toward the inshore side of the front and to minimize sample hold before processing.**