

Science Themes

Climate Variability, Ocean Food Webs, and Biogeochemical Cycling

A compelling driver for the multidisciplinary and biogeochemical observations at Ocean Station Papa is understanding how climate variability will affect ocean food webs, weather patterns, the ocean's biochemical environment and marine ecosystems.

Turbulent Mixing and Biophysical Interactions

Turbulent mixing plays a critical role in the transfer of materials within the ocean and in the exchange of energy and gases between the ocean and atmosphere. Additionally, horizontal and vertical mixing within the ocean can have a profound effect on a wide variety of biological processes.

Ocean-Atmosphere Exchange

Quantifying the air-sea exchange of energy and mass, especially during high winds (greater than 20 ms^{-1}), is critical to providing estimates of energy and gas exchange between the surface and deep ocean and to improving the predictive capability of storm forecasting and climate-change models. Ocean Station Papa investigates these questions by collecting complementary data to NOAA's PMEL Carbon Buoy.

Assets

At Station Papa, OOI deploys two Subsurface Flanking Moorings A & B (GP03FLMA & GP03FLMB), an Apex Profiler Mooring (GP02HYPM), and gliders as complements to NOAA's surface assets. Flanking moorings are equipped with oxygen, chlorophyll, and pH sensors at 30 m, as well as CTDs at regular intervals from 30 m to 1500 m, and an ADCP for the upper 500 m. The profilers (shallow from 156 to 2090 m and deep from 2129 to 4063 m) are equipped with CTD, oxygen, chlorophyll. The top sphere is equipped with a zooplankton sensor.

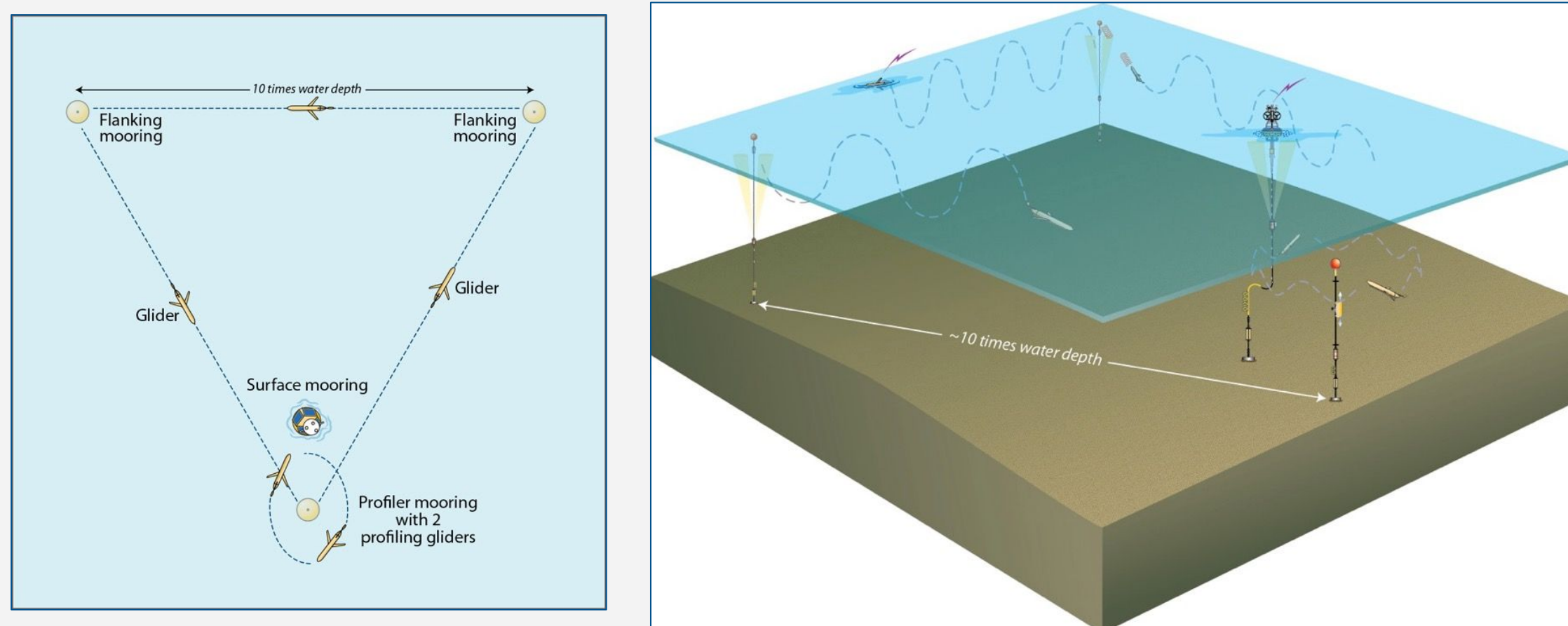


Figure 1 - Top: Schematic of a global array. **Bottom** (clockwise from top left): A global hybrid wire-following-profile mooring being deployed; two global open ocean gliders; a global surface mooring being deployed; a wire-following profiler.



Available Data

Depth (m)	Instrument / Measurement	Samples			
		O2/Salts	Carbon	Nitrates	Chlorophyll
Flanking Moorings					
surf		Optional			
30	CTD, DO, Flor, pH		DIC/TA, pH	Optional	
40	CTD	Optional			
Chl max					
60	CTD				
90	CTD				
130	CTD			Optional	
180	CTD	Optional			
250	CTD				
350	CTD	Optional			
500	CTD, ADCP				
750	CTD	Optional			
1000	CTD				
1500	CTD				
~bottom					
Global Hybrid Profiler Mooring					
surf		Optional			
30		Optional	DIC/TA, pH		
Chl max					
150	CTD, Zooplankton				If fluor sig.
156-2090	Profiler - CTD, DO, Flor, Velocity	400-600 m increments			
2129-4063	Profiler - CTD, DO, Flor, Velocity	400-600 m increments			
Gliders					
surf					GPG
30					GPG
50	Global Profiling Glider (GPG) - CTD, DO, Flor, Nitrate, PAR				GPG
100					GPG
200	Open Ocean Glider - CTD, DO, Flor				GPG
300-1000		100 m increments			If fluor sig.

Table 1. Table of available datasets on different platforms at the OOI Papa array along with discrete water sampling, which occurs during deployment/recovery.

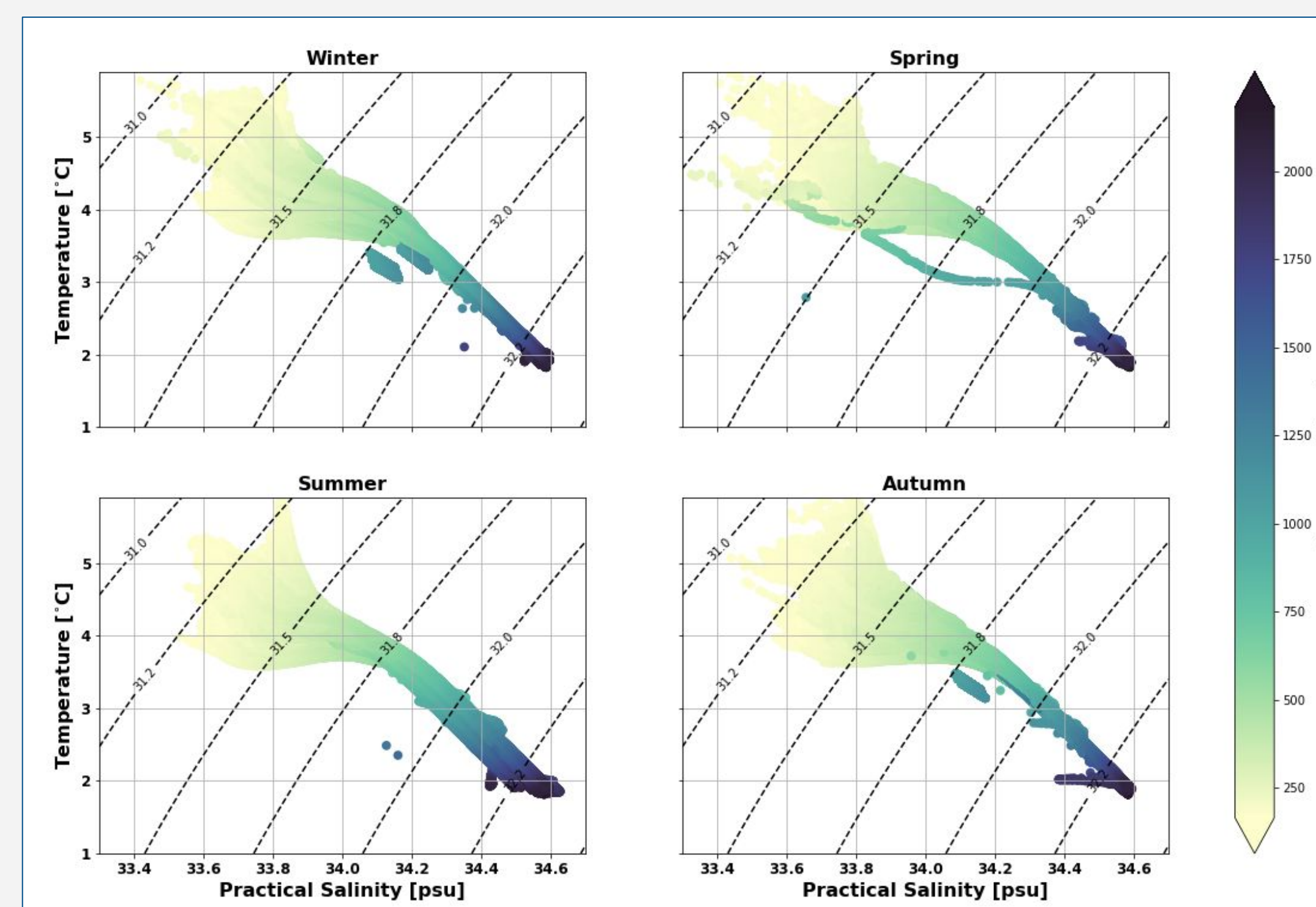


Figure 2. Temperature-Salinity diagrams with pressure from the Upper Wire Following Profiler divided by season.

Example Data Visualization

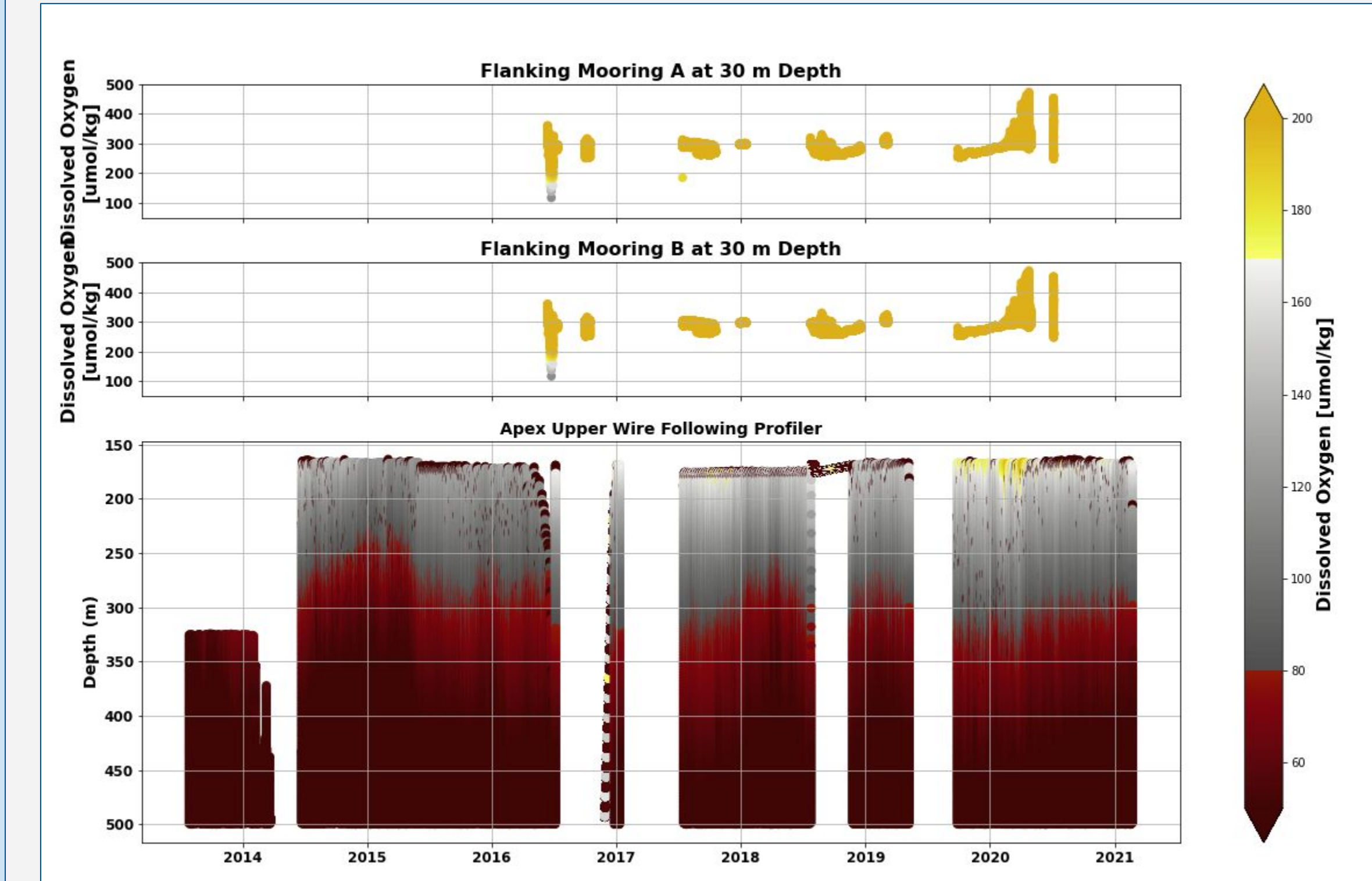


Figure 3. Dissolved oxygen concentrations collected by the OOI Flanking Mooring A (top), Flanking Mooring B (middle), and the Upper Wire Following Profiler (bottom).

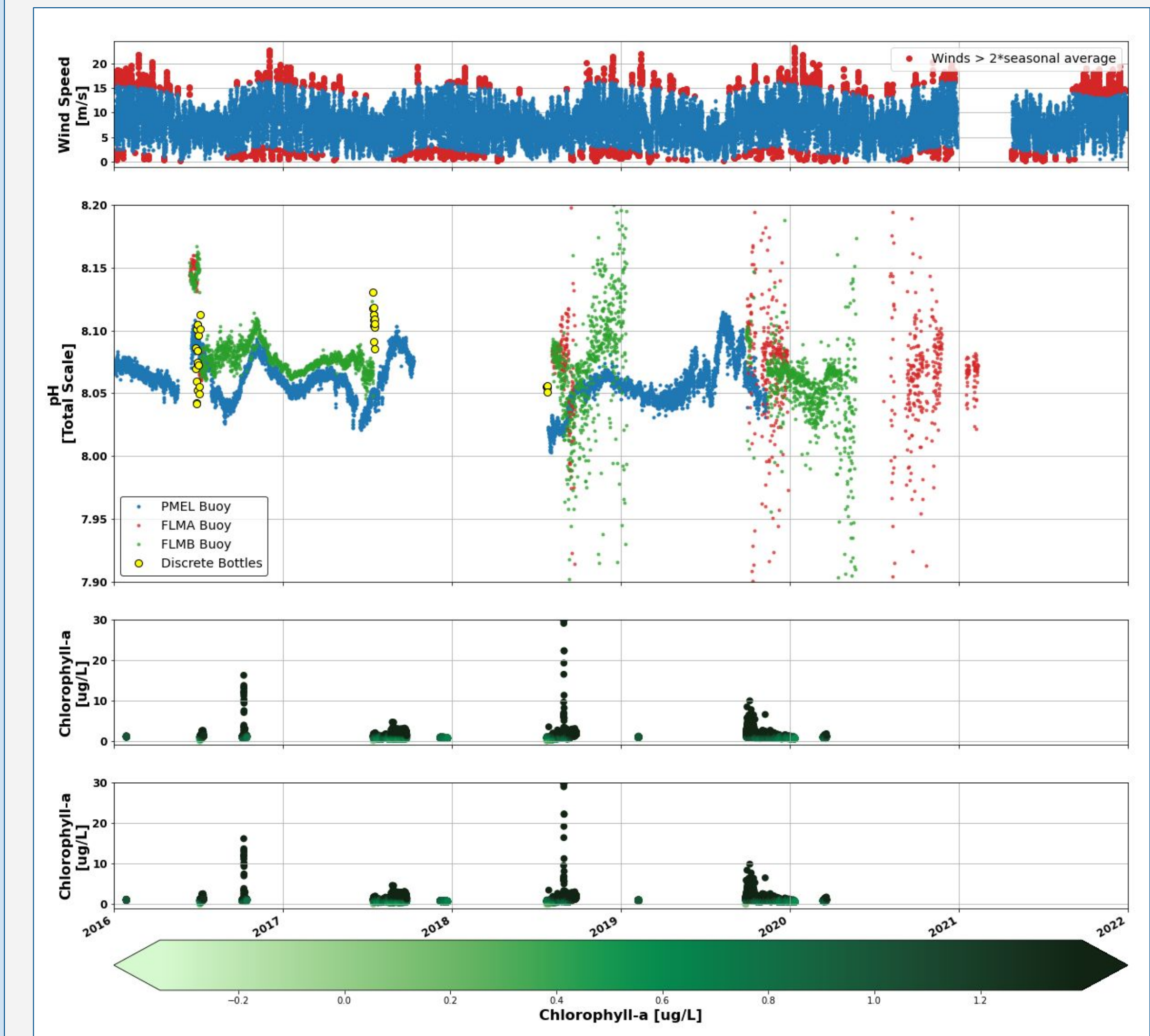


Figure 4. Example of integrating physical & biogeochemical datasets from different sources to address potential questions for some of the major science themes. (Top) NOAA PMEL's surface buoy met measurements; (Middle) Seawater pH from both OOI Flanking Moorings & PMEL buoy along with discrete bottle measurements; (Bottom) Chlorophyll-a concentrations from OOI Flanking Moorings.

Notes: Figure 1 photos by Rebecca Travis & Andrew Reed. Table 1 adapted from OOI-CGSN water sampling SOP by Sheri White. Data for Figures 2, 3, & 4 downloaded from ooinet.oceanobservatories.org via M2M API. Scripts available at github.com/reedan88/OOI-NE-Community-Workshop. Water sampling data available at alfresco.oceanobservatories.org.