Coastal Ocean Observing in the Northeast Pacific

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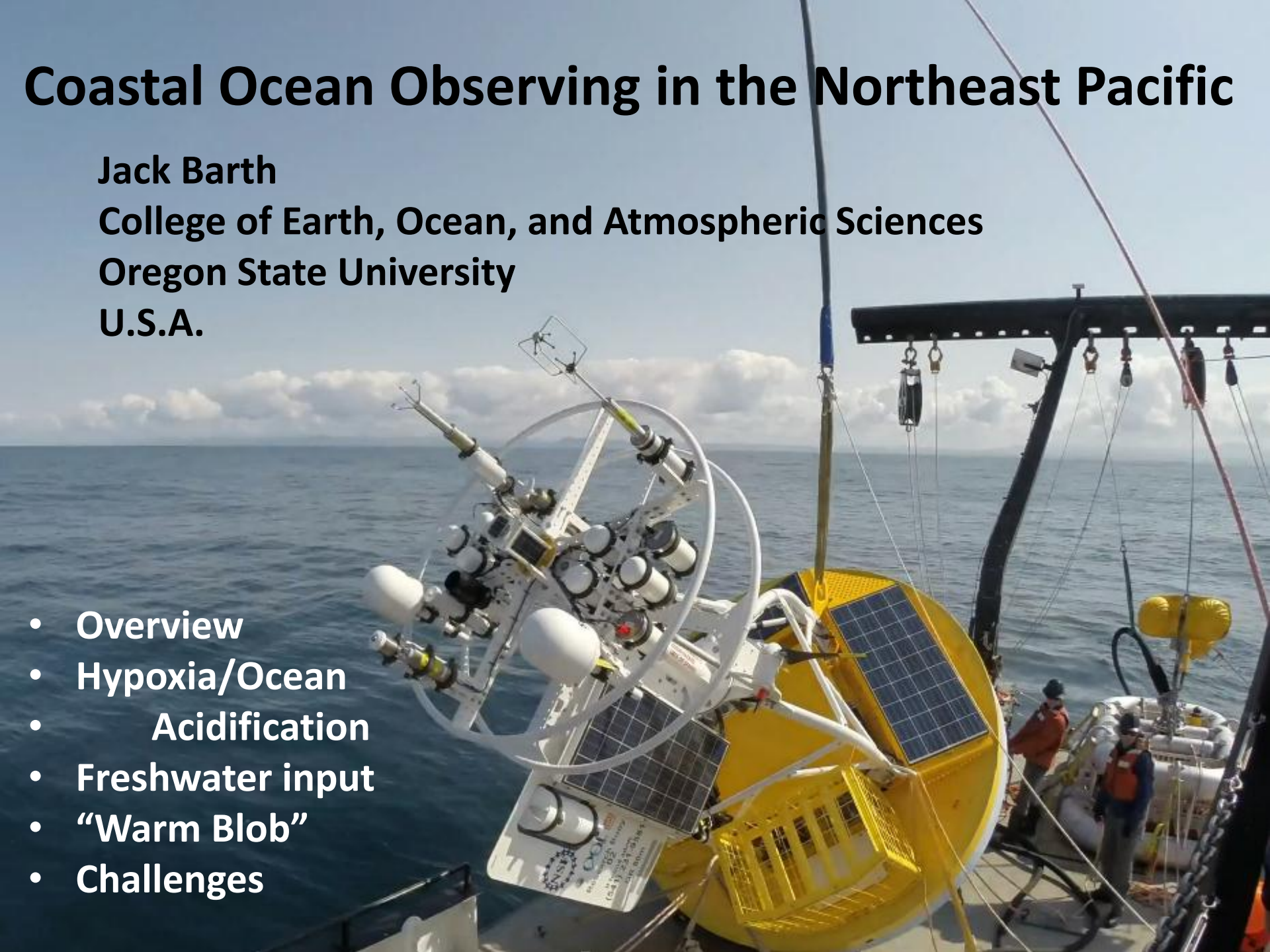
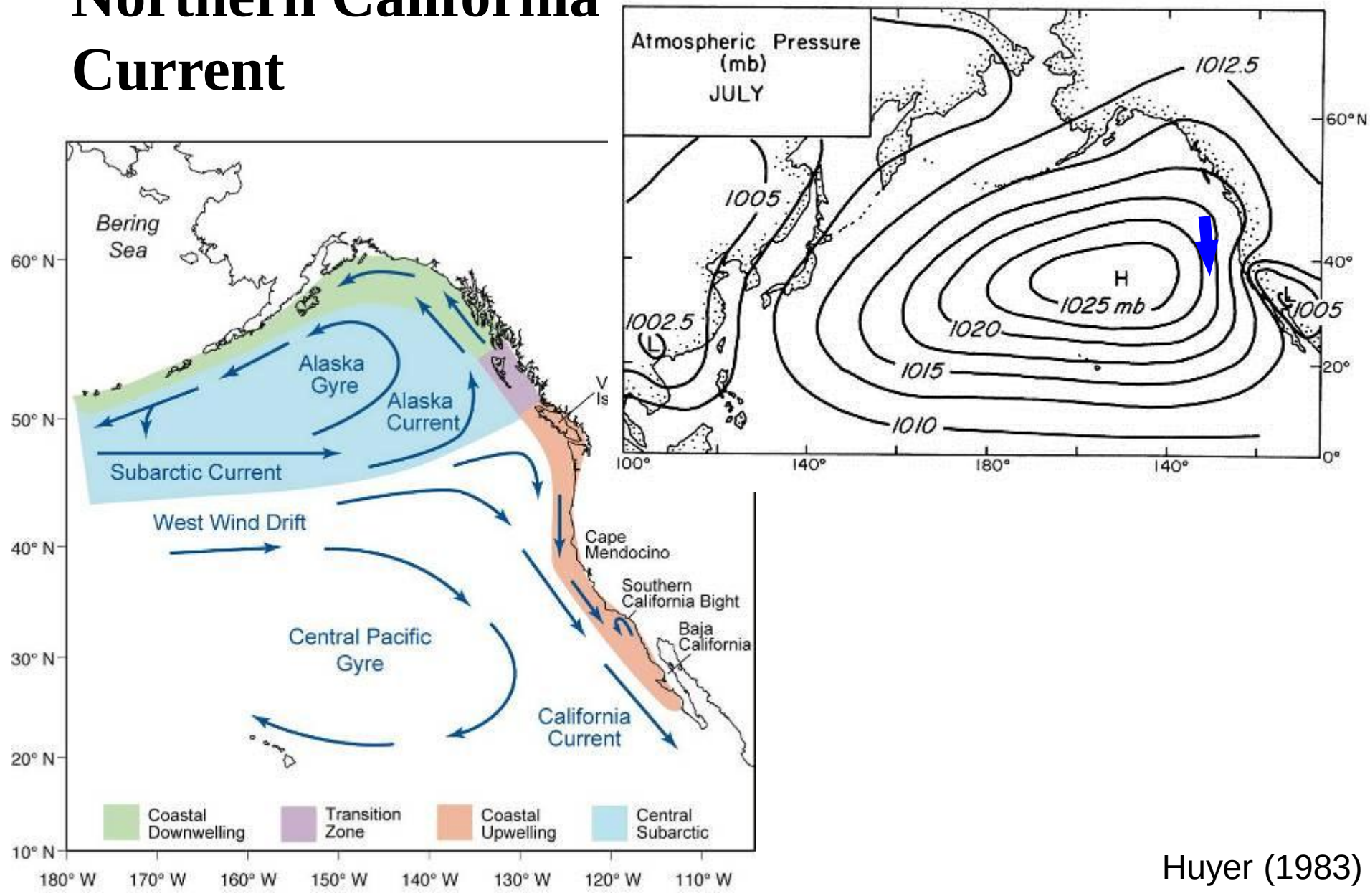


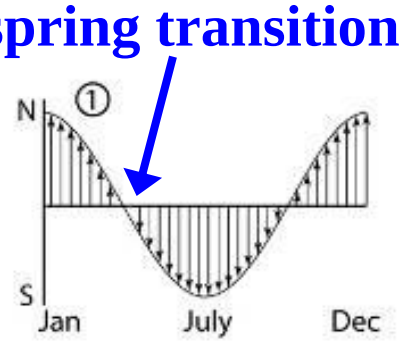
- Overview
- Hypoxia/Ocean
- Acidification
- Freshwater input
- “Warm Blob”
- Challenges

Wind Forcing and Large-Scale Circulation: Northern California Current

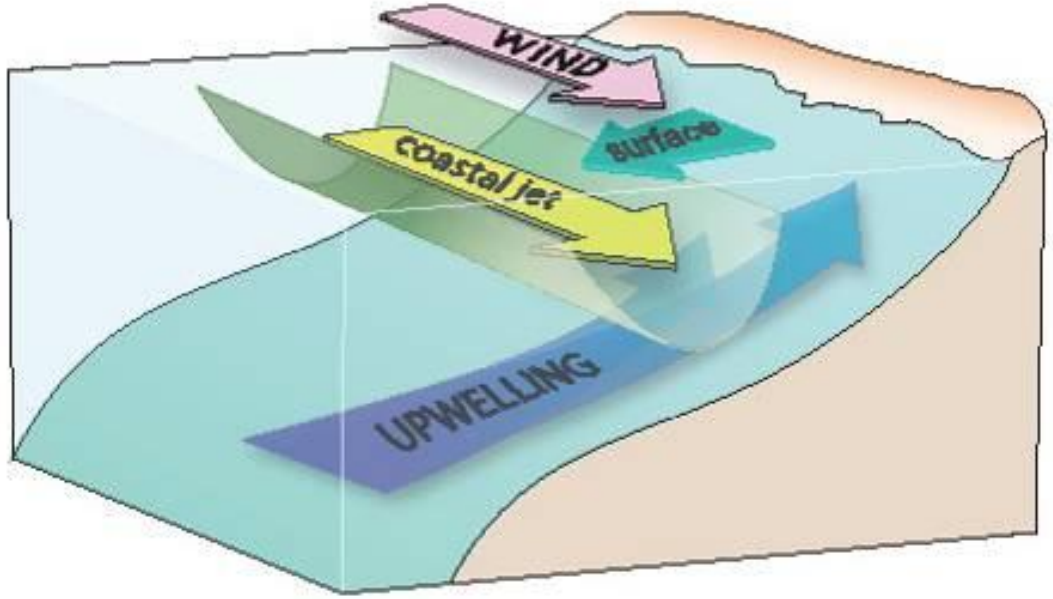


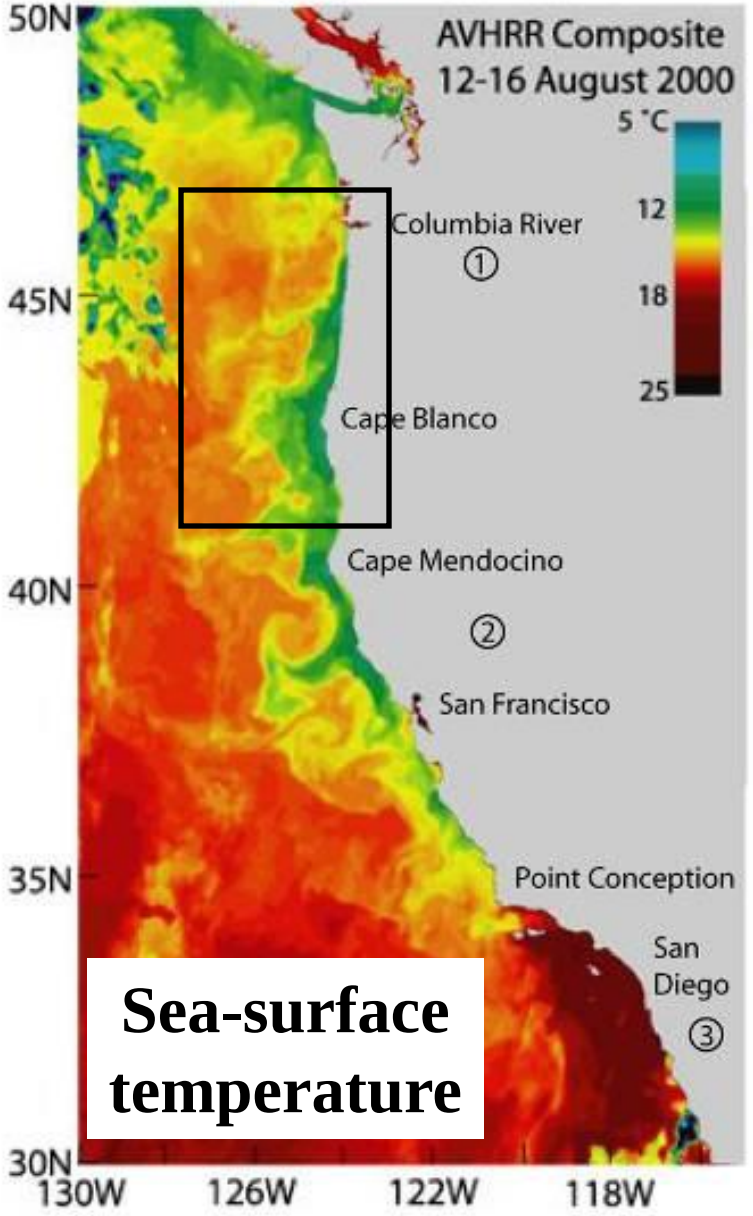
Huyer (1983)

Upwelling supports a productive marine ecosystem in the Northern California Current



Seasonal cycle of winds





Sea-surface temperature

A wide range of coastal ocean observing in the NE Pacific

- US Integrated Ocean Observing System (NOAA)
- NOAA fishery surveys (groundfish, hake, sardine)
- Long-term hydrographic and zooplankton lines
- Gliders
- Wave buoys and wave models
- Rocky intertidal biodiversity and recruitment
- Carbon chemistry (pCO2, pH) (NOAA, university)
- National Science Foundation's Ocean Observatories Inititiative (OOI)

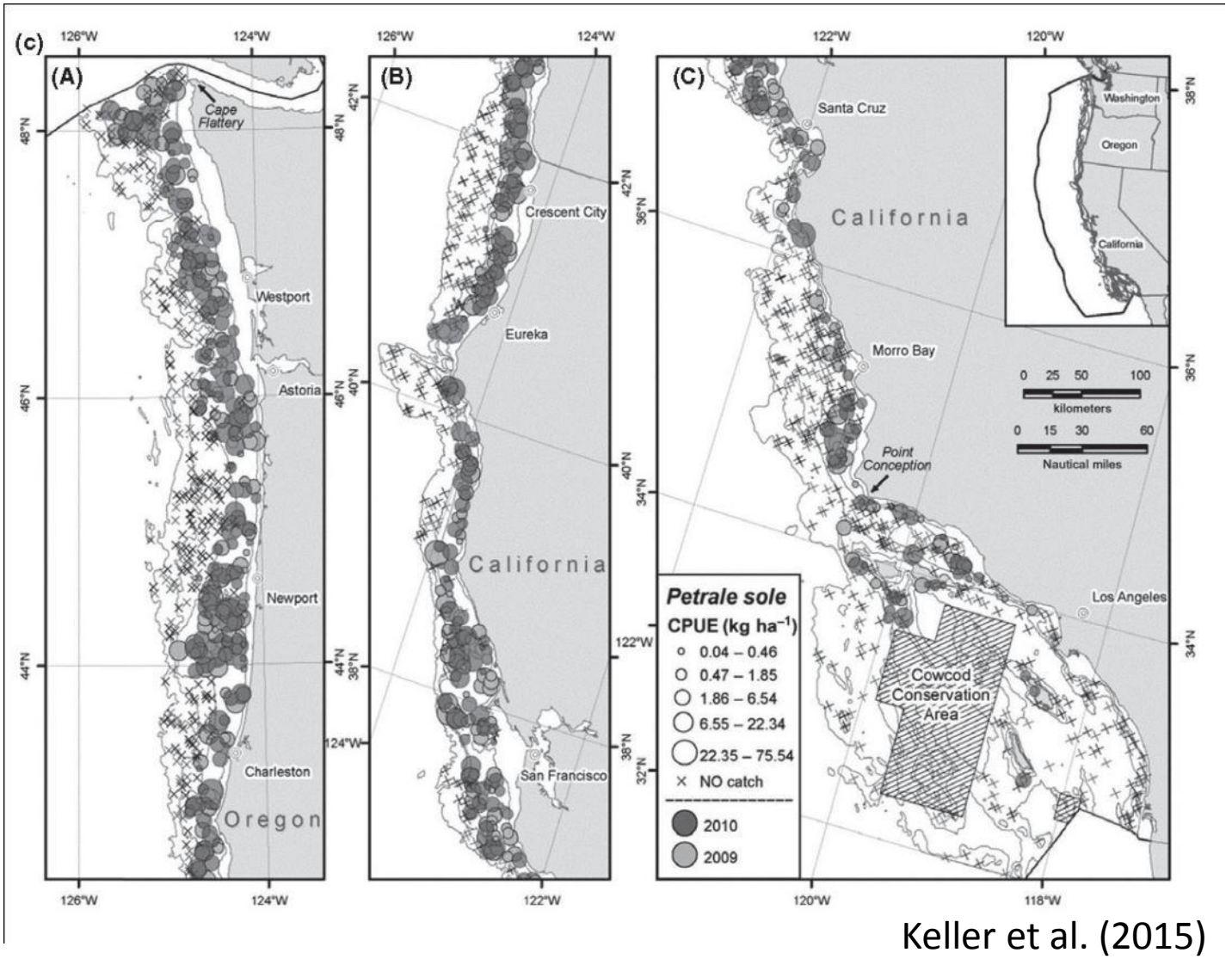
U.S. West Coast Integrated Ocean Observing Systems (IOOS)

- **Northwest Association of Networked Ocean Observing Systems (NANOOS)**
  - WA and OR
  - Headquartered at UW in Seattle
- **Central and Northern California Ocean Observing System (CeNCOOS)**
  - OR/CA border to Pt Conception
  - Headquartered at MBARI in Moss Landing
- Southern California Coastal Ocean Observing System (SCCOOS)
  - Pt Conception to CA/Mexico border
  - Headquartered at SIO in La Jolla

NOAA NWFSC annual groundfish survey

Catch Per Unit Effort for Petrale sole (*Eopsetta jordani*)

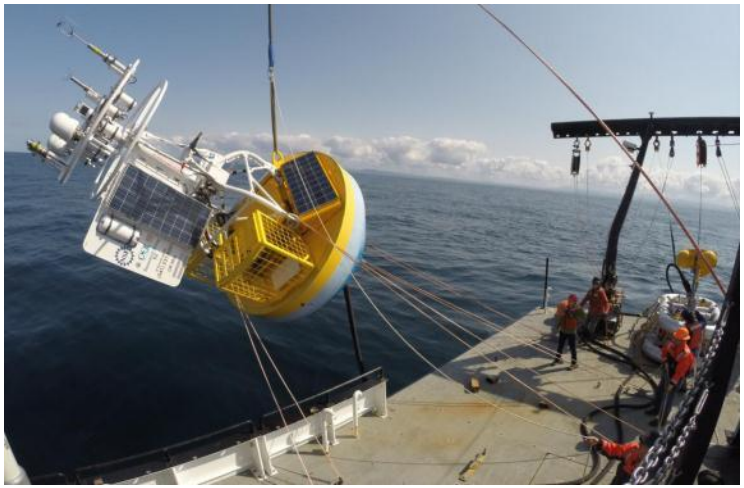
also measure temperature, salinity, and dissolved oxygen

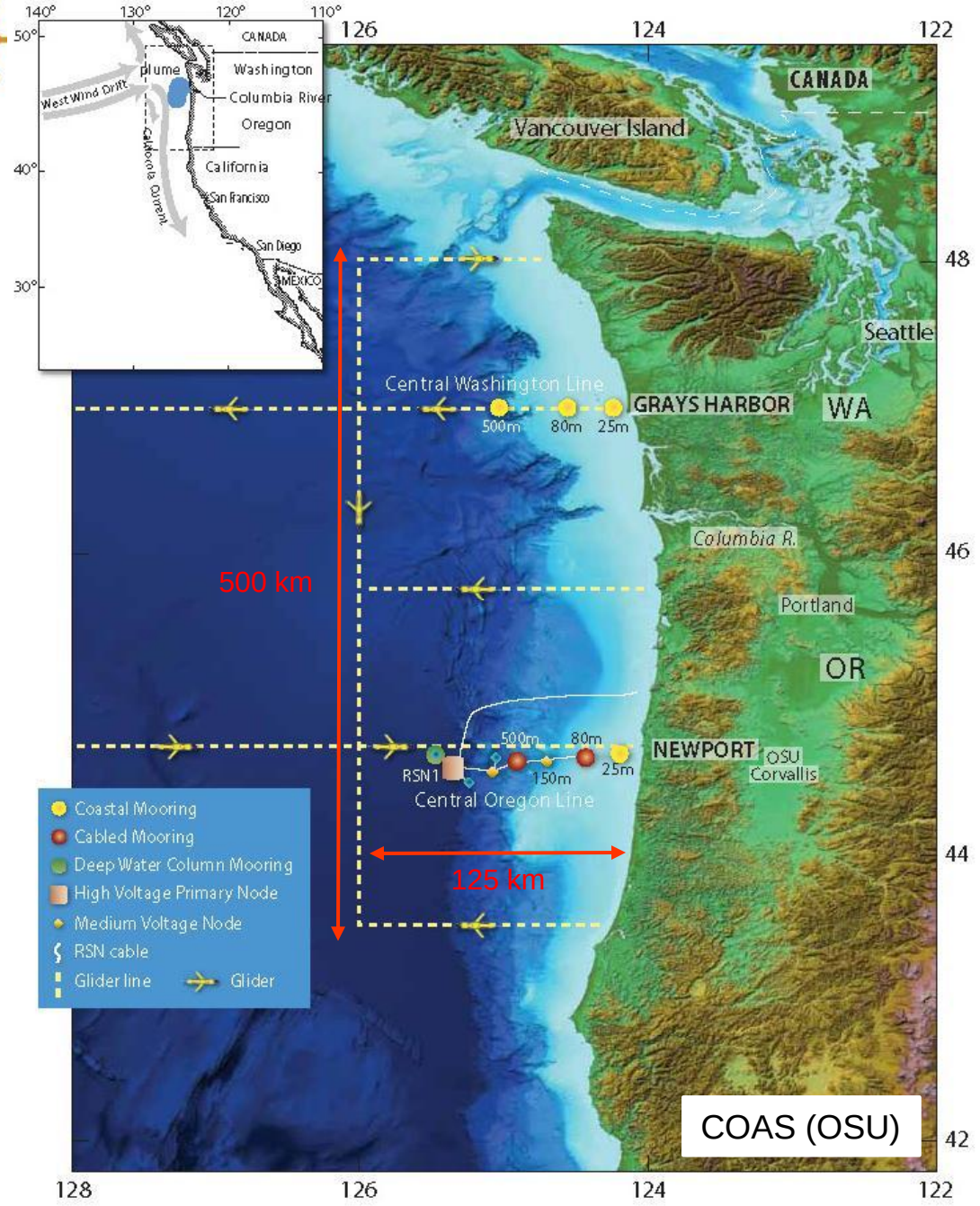


Keller et al. (2015)

Ocean Observatories Initiative (OOI)

“Endurance Array” just installed off Oregon and WA

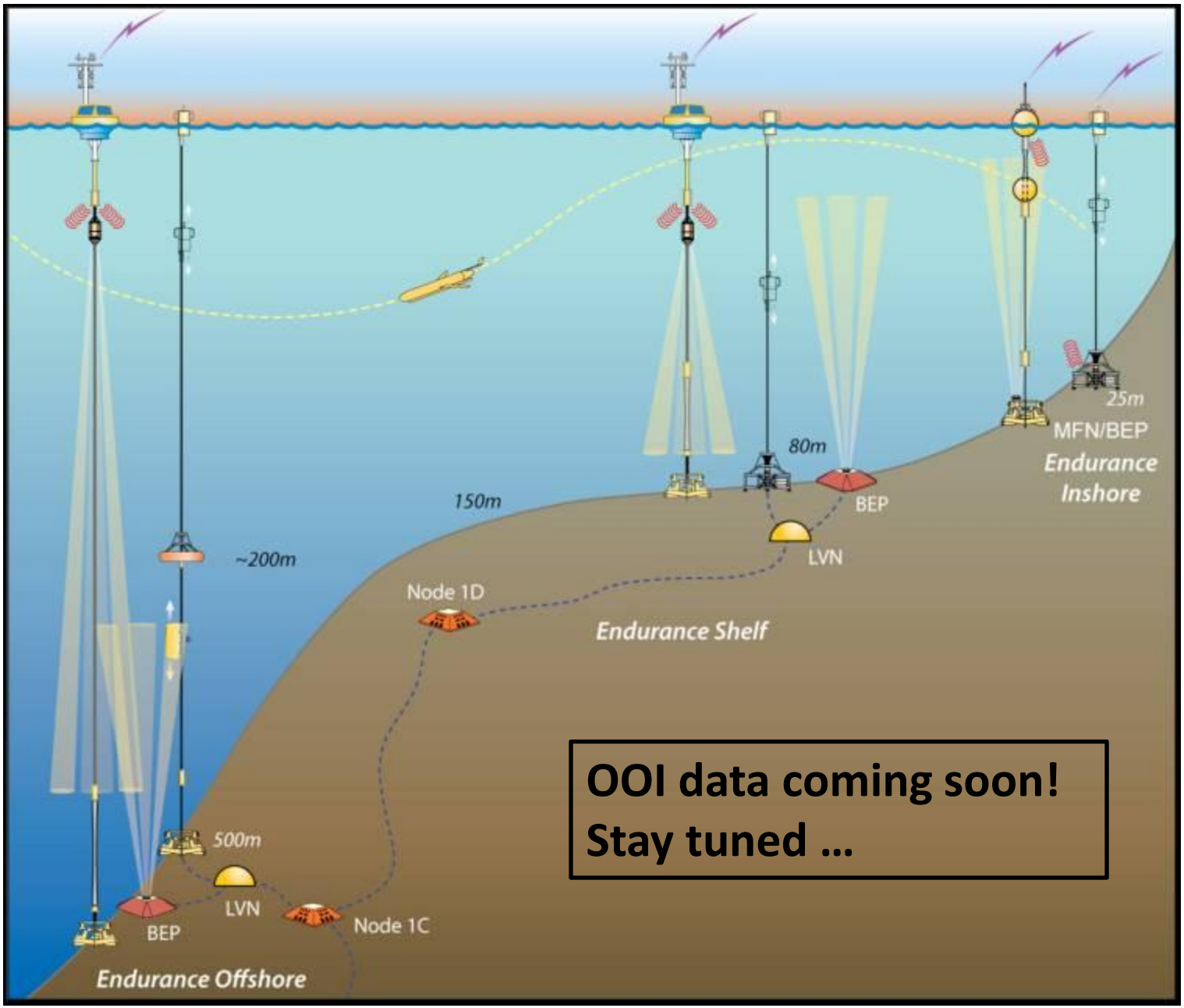


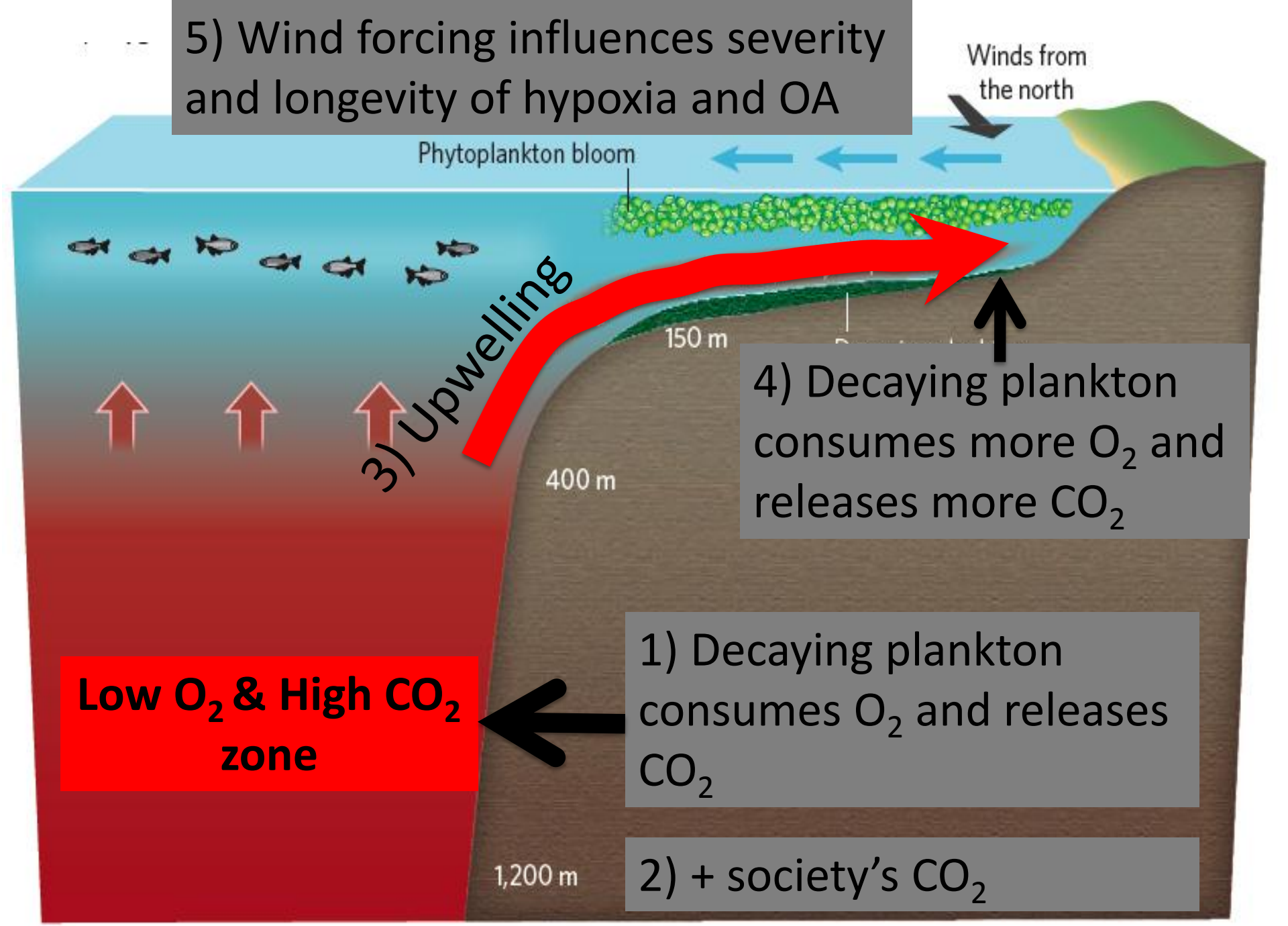


COAS (OSU)

OOI Endurance Array

- Full water column
- Cross-shelf resolution
- High power, high bandwidth via cable to 80 & 500m
- Benthic platforms
- Dissolved Oxygen, pH, pCO2,

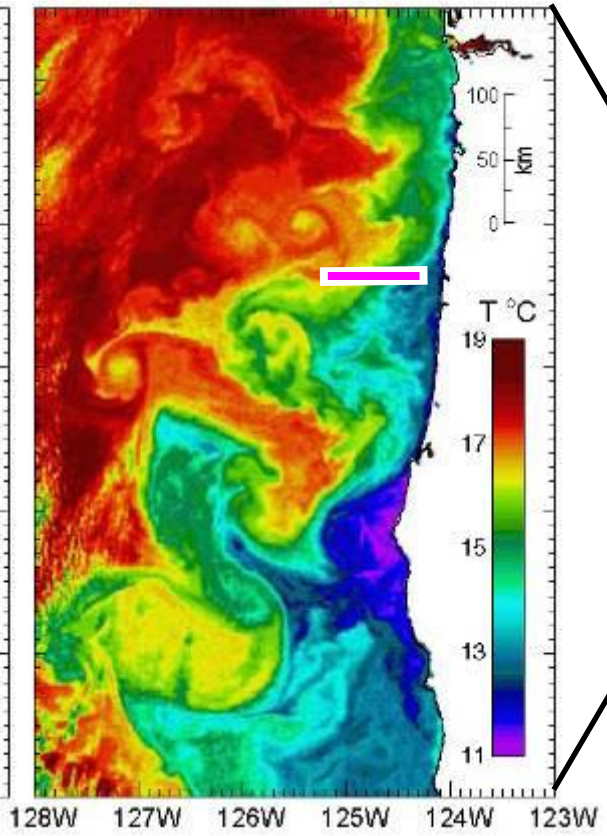


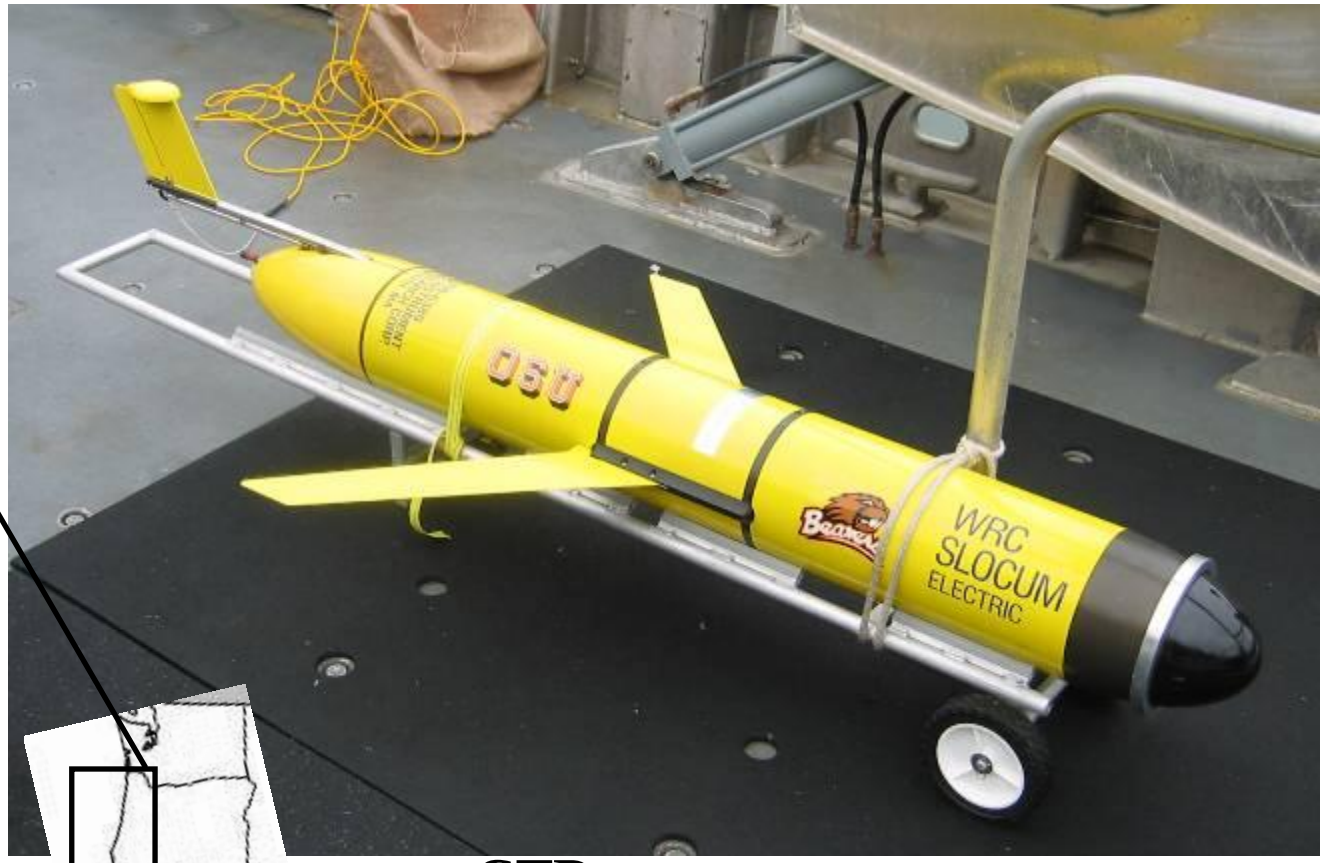


Modified from Gewin (2011)

Autonomous Underwater Vehicle Gliders

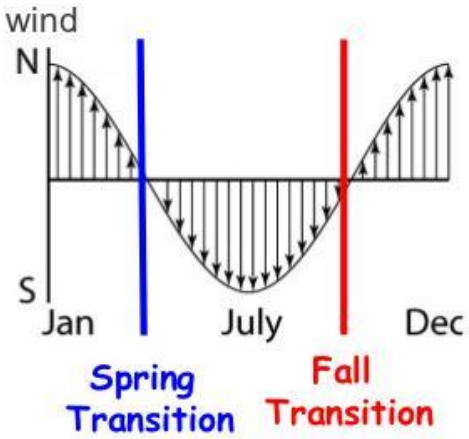
cross-margin transect twice per week since April 2006

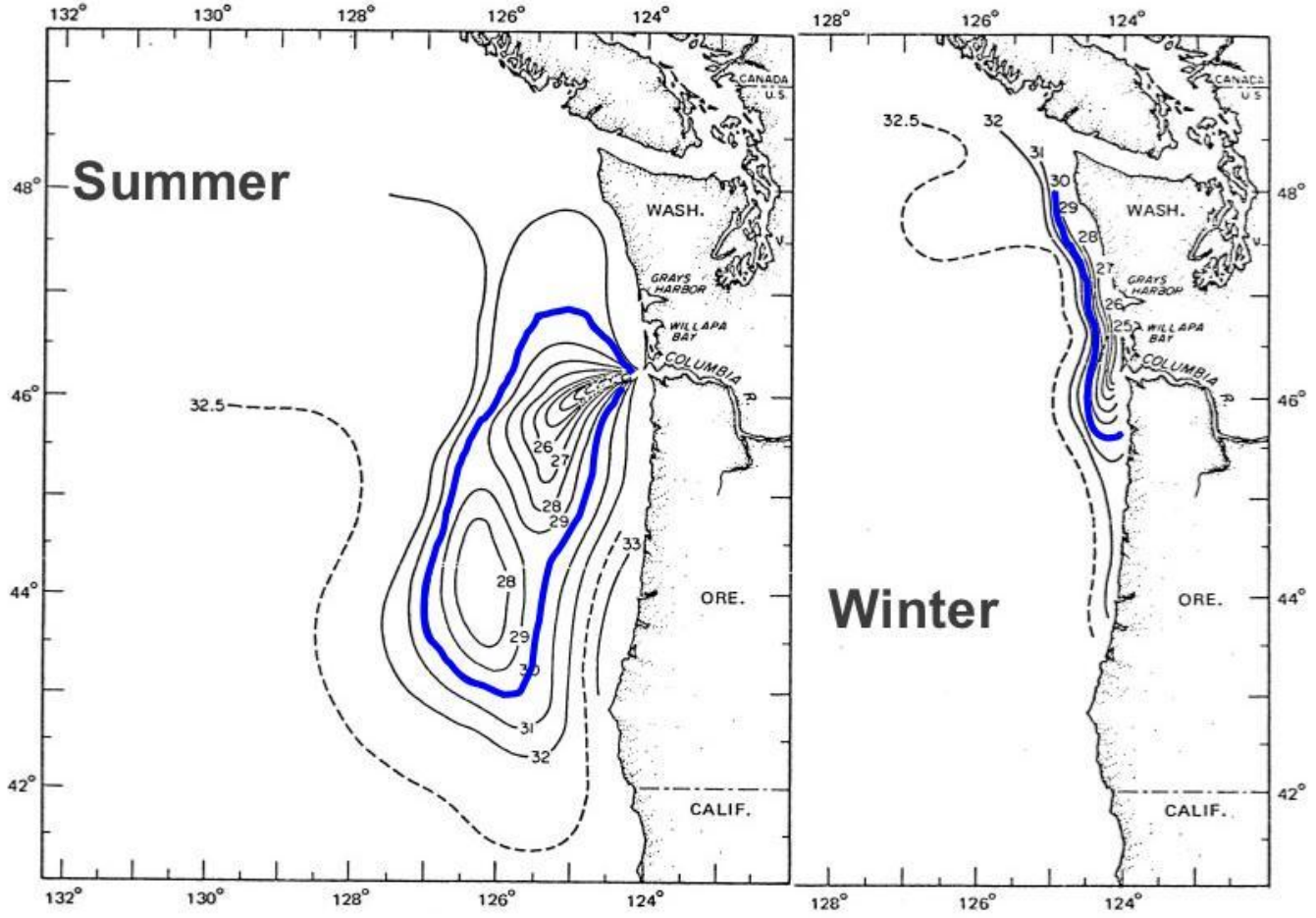




CTD
dissolved oxygen
chlorophyll fluorescence
CDOM fluorescence
light backscatter
depth-averaged velocity

Columbia River – largest river on US west coast

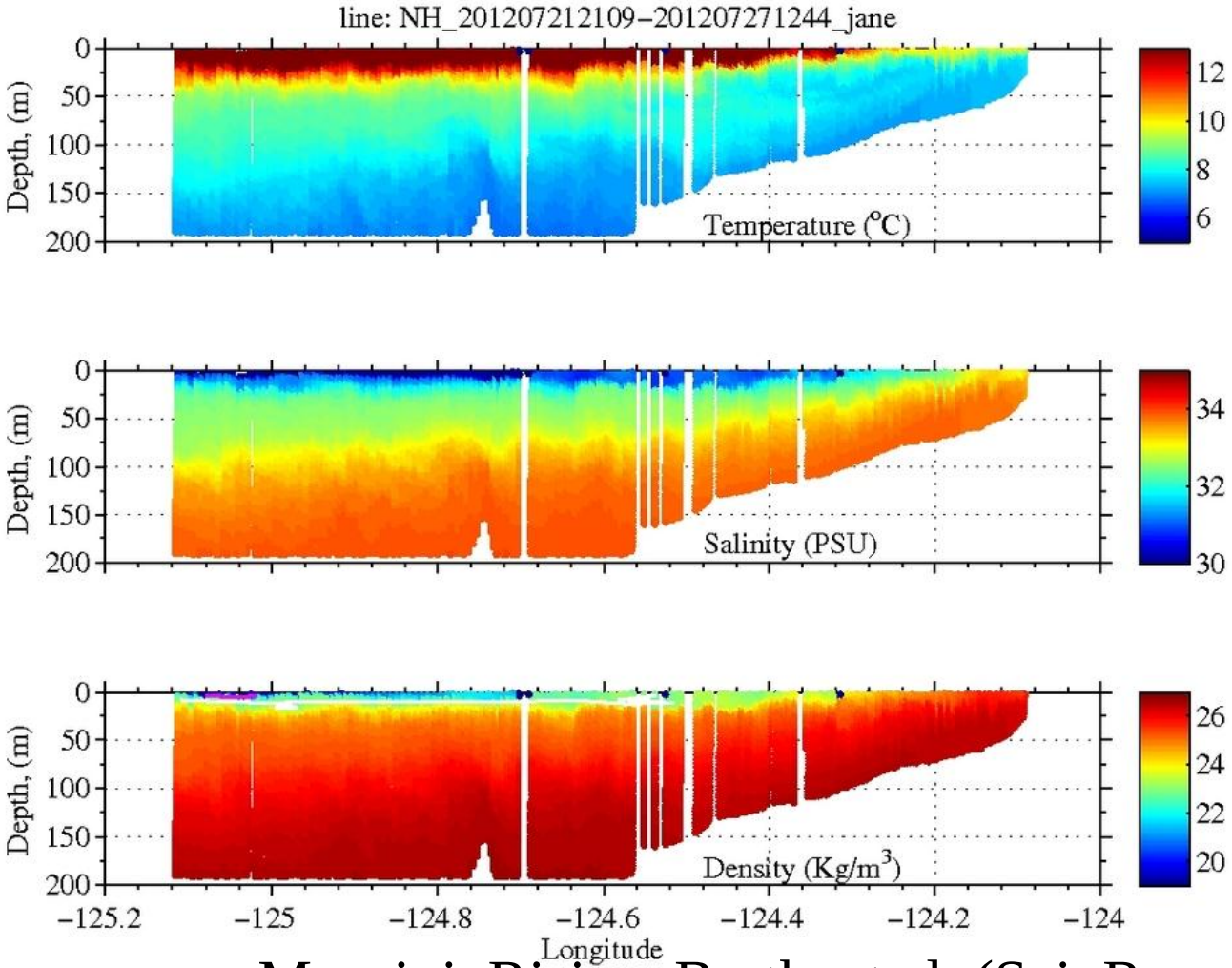


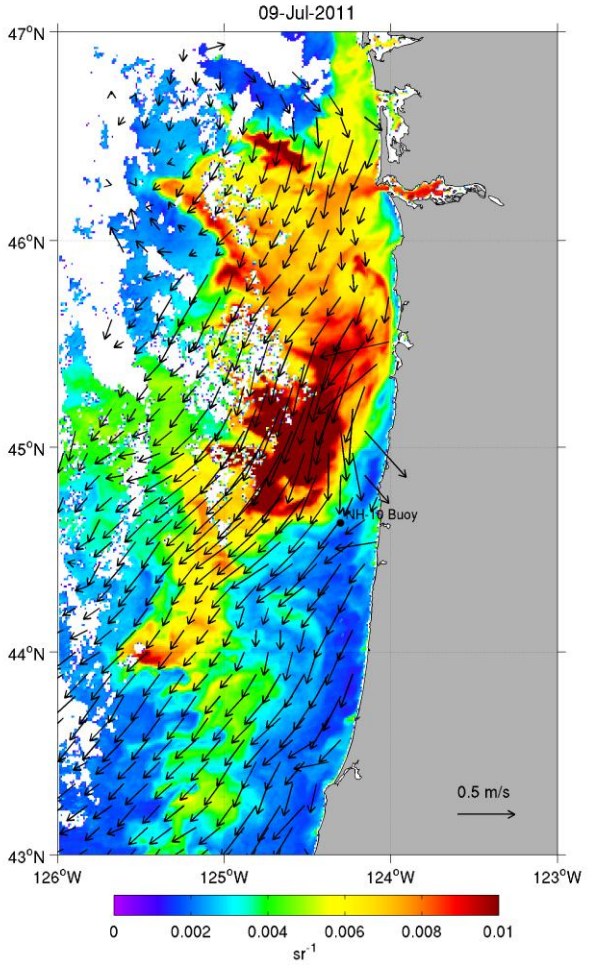


Barnes *et al.* (1972)

Low-salinity pulses from Columbia River

glider line

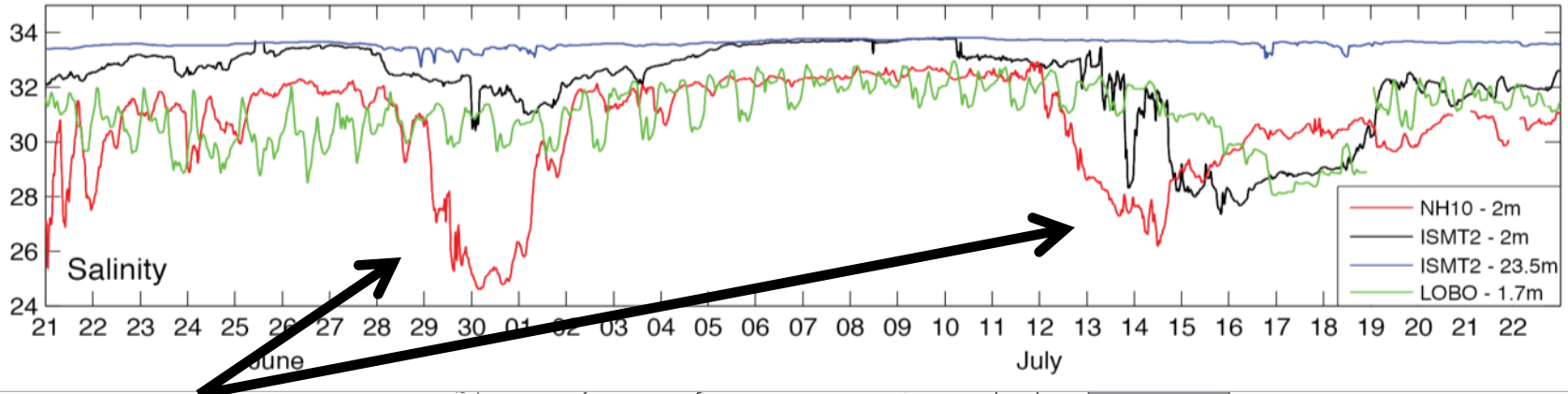




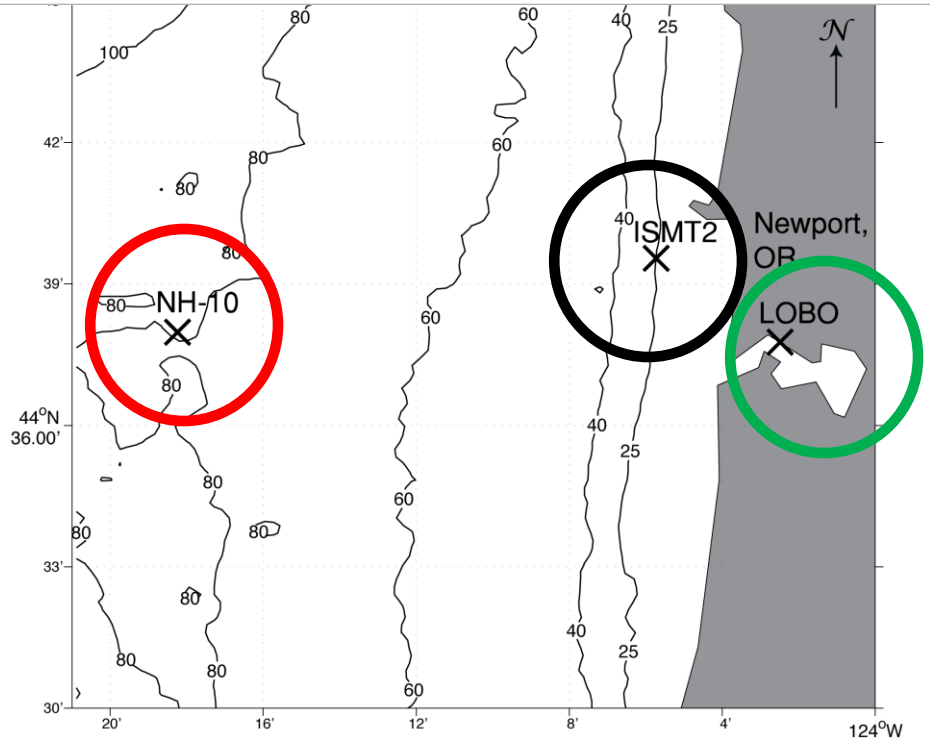
High-frequency radar currents on top of satellite color

Mazzini, Risien, Barth, et al. (Sci. Reports, in press)

Use observatory to track distant-river freshwater pulses entering local estuaries

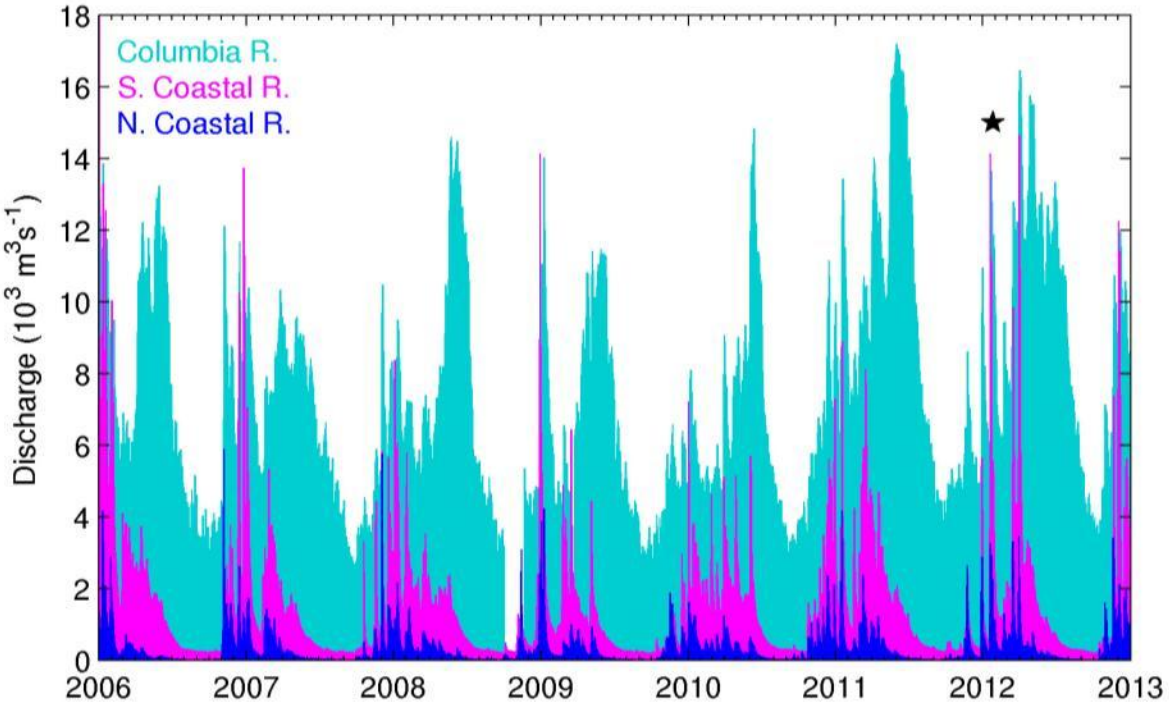


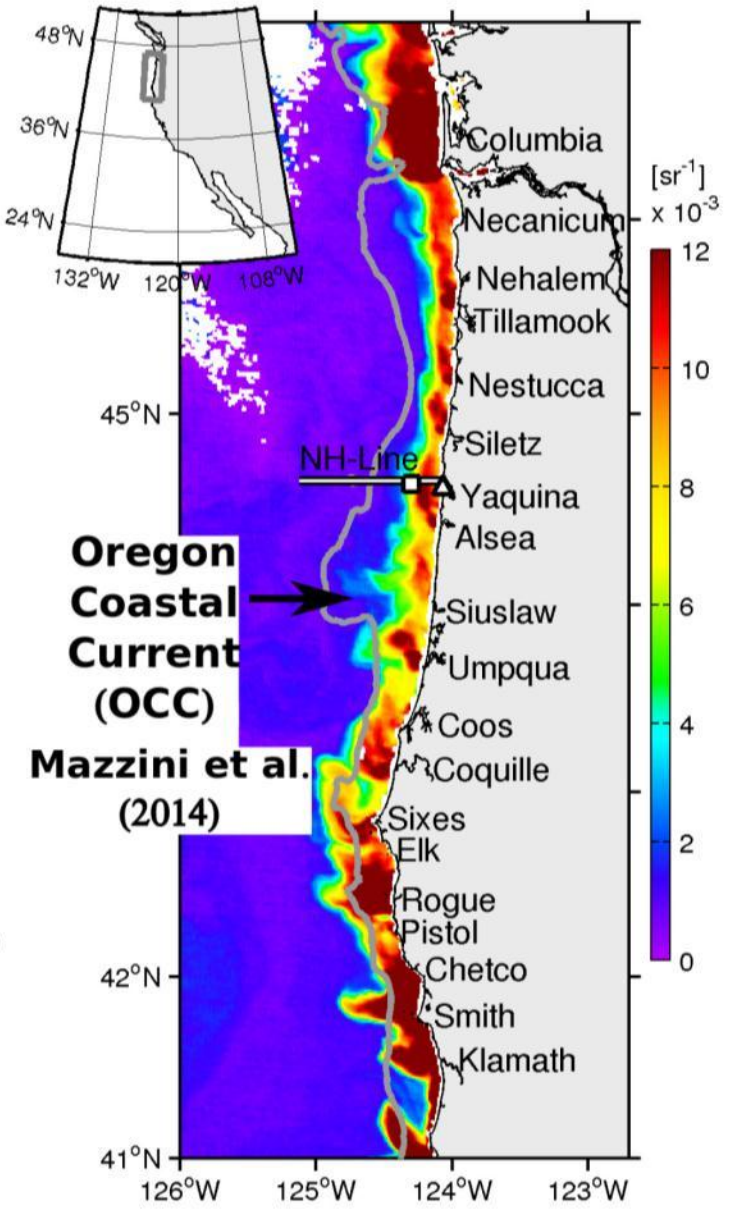
Pulses of Columbia River discharge measured off Newport, Oregon
(CR is 180 km to the north)



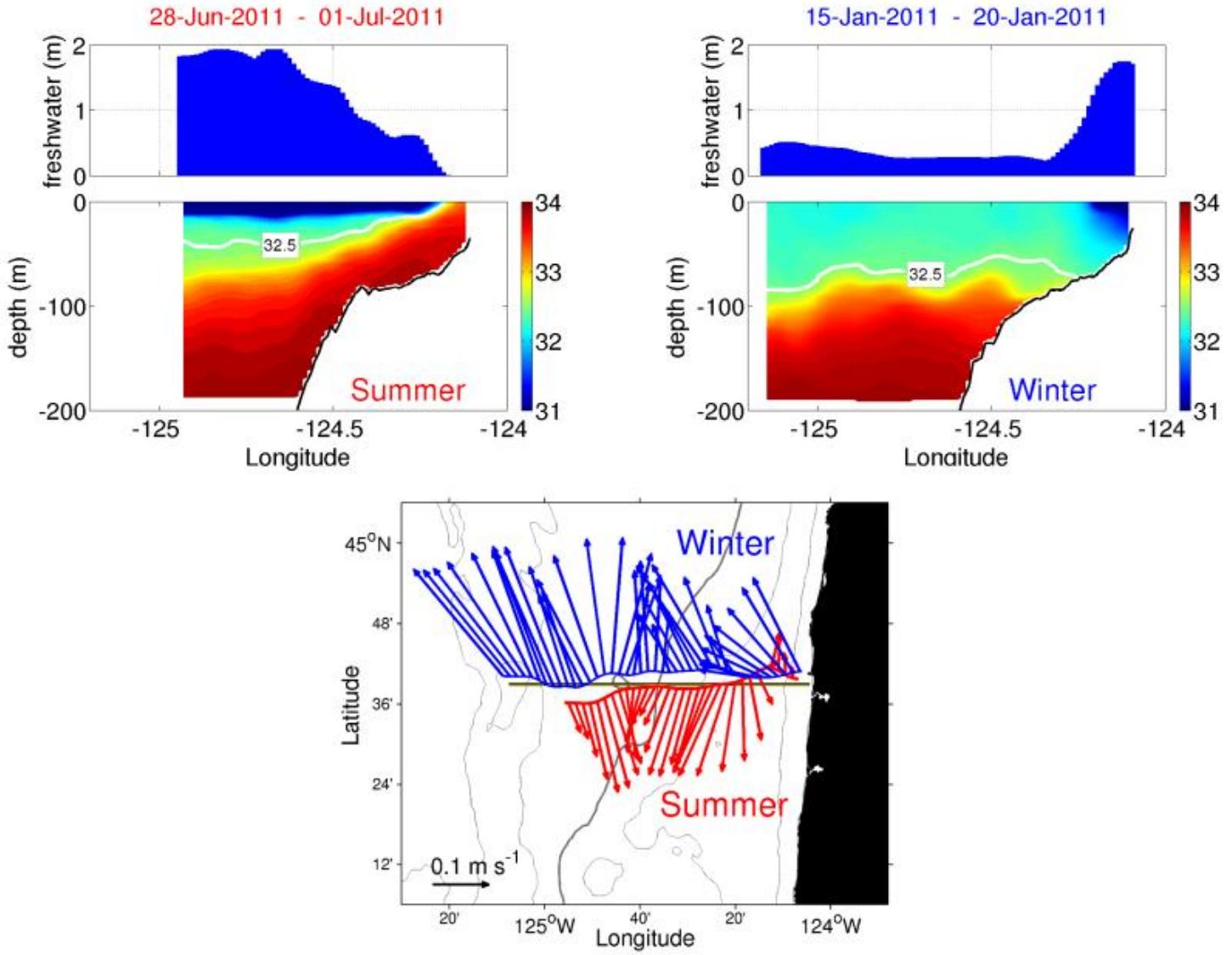
Mazzini, Risien, Barth, et al. (Sci. Reports, in press)

In winter, many coastal rivers drive a strong northward buoyancy current



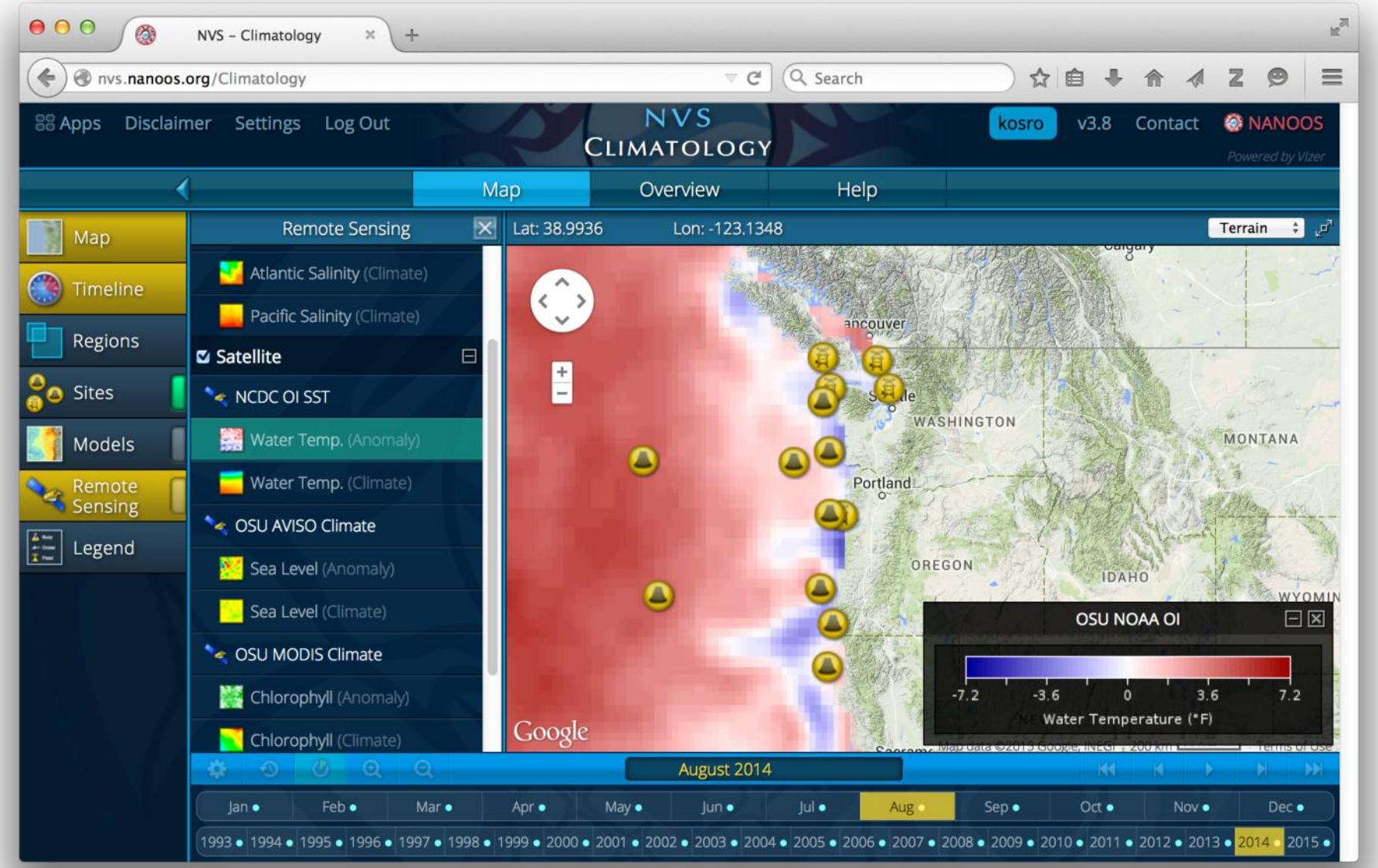


Example glider lines: summer vs. winter



Mazzini, Barth, Shearman and Erofeev (JPO, 2014)

NANOOS Visualization System (NVS): nvs.nanoos.org/Climatology



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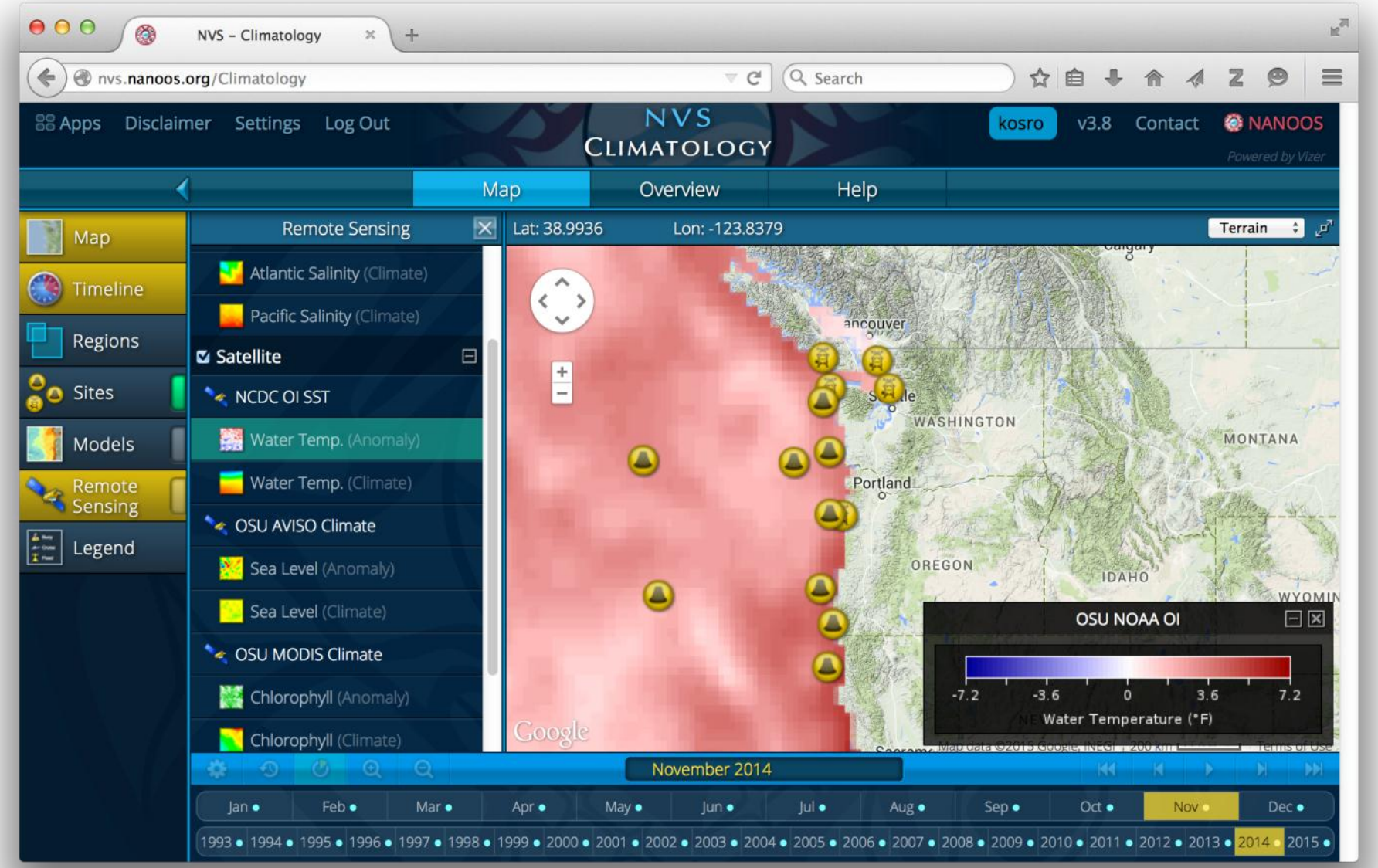

Challenges we all face:

- Hostile ocean environment
- Limited or hard to schedule ship time to service observing system
- Limited power
- Can’t measure everything electronically
- Under-resourced data quality control and archiving

- Bio-fouling !!

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Summary and Challenges

- Multi-platform, multi-sensor observing array
- Addresses societal challenges
- Cooperation
- Sustainability
- Quality control
- biofouling