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LiveOcean: a daily forecast model of biogeochemistry in Washington marine waters

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LiveOcean: A Daily Forecast Model of Biogeochemistry in Washington Marine Waters

- Parker MacCready
- Samantha Siedlecki
- Ryan McCabe
- Neil Banas
LiveOcean: Overview

• **GOAL 1:** Short-term forecasts of Aragonite saturation state & pH of waters entering shellfish growing areas

• **GOAL 2:** Short-term forecasts of Phytoplankton Blooms and Surface Water Advection from known Pseudo-nitzschia HAB Hotspots.

• **MODEL:** ROMS, 1.5 km grid, realistic tides, rivers, atmospheric forcing, and open ocean state

• **RESULTS:**
  - 3-day forecasts of currents, temperature, salinity & biogeochemistry, including carbon (DIC, Alkalinity)
  - Forecasts available daily: NANOOS NVS
  - Automated Particle Tracking for HAB Bulletin
  - Validation 2013-present
LiveOcean Workflow

3-Day forecast appears daily on NANOOS NVS

WRF Winds and Heating

HYCOM Ocean Fields

USGS Rivers

TPXO Tides

ROMS
Model-Observation Comparison (Barth, Durski)
Mid-shelf, Heceta Bank mooring: T, S, Dissolved Oxygen

- **Temperature**
  - Corr. coef = 0.81
  - RMS diff. = 0.68
  - Bias (M-O) = 0.06

- **Salinity**
  - Corr. coef = 0.71
  - RMS diff. = 0.19
  - Bias (M-O) = -0.11

- **Dissolved Oxygen**
  - Corr. coef = 0.63
  - RMS diff. = 0.96
  - Bias (M-O) = -0.50
Chemical Validation: NOAA Casts 2016
May

Surface $\Omega_{arag}$

Bottom $\Omega_{arag}$

200 m
2000 m

0.1 Pa
Windstress

2017-05-15
12:00 UTC

$0.5 \text{ ms}^{-1}$
July

Surface $\Omega_{arag}$

Latitude

Longitude

Bottom $\Omega_{arag}$

200 m
2000 m

0.1 Pa
Windstress

2017-07-15
12:00 UTC

cascadia_base_obio5
Conclusions

• pH and Aragonite Saturation State on the shelf have a dramatic annual cycle
• During the spring and summer upwelling brings corrosive water onto the shelf (and into the Salish Sea)
• Remineralization on the shelf makes the bottom water on the shelf more corrosive
• The same pattern exists for hypoxia