Apr 5th, 2:00 PM - 2:15 PM

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

WOAC
WASHINGTON OCEAN ACIDIFICATION CENTER

CMG
UW Coastal Modeling Group

NANOOS

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

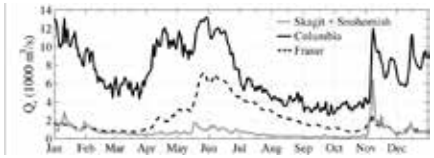
LiveOcean Workflow

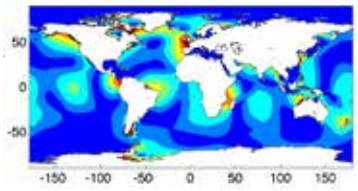
WRF Winds and Heating

HYCOM Ocean Fields

USGS Rivers

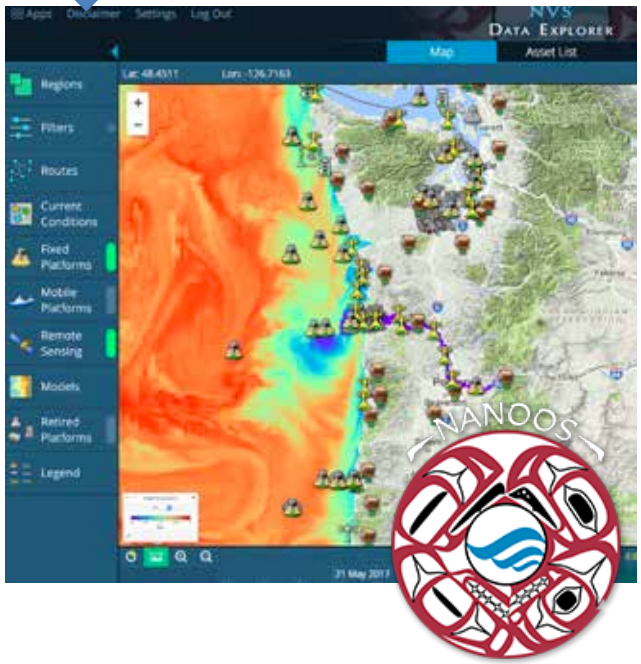
TPXO Tides





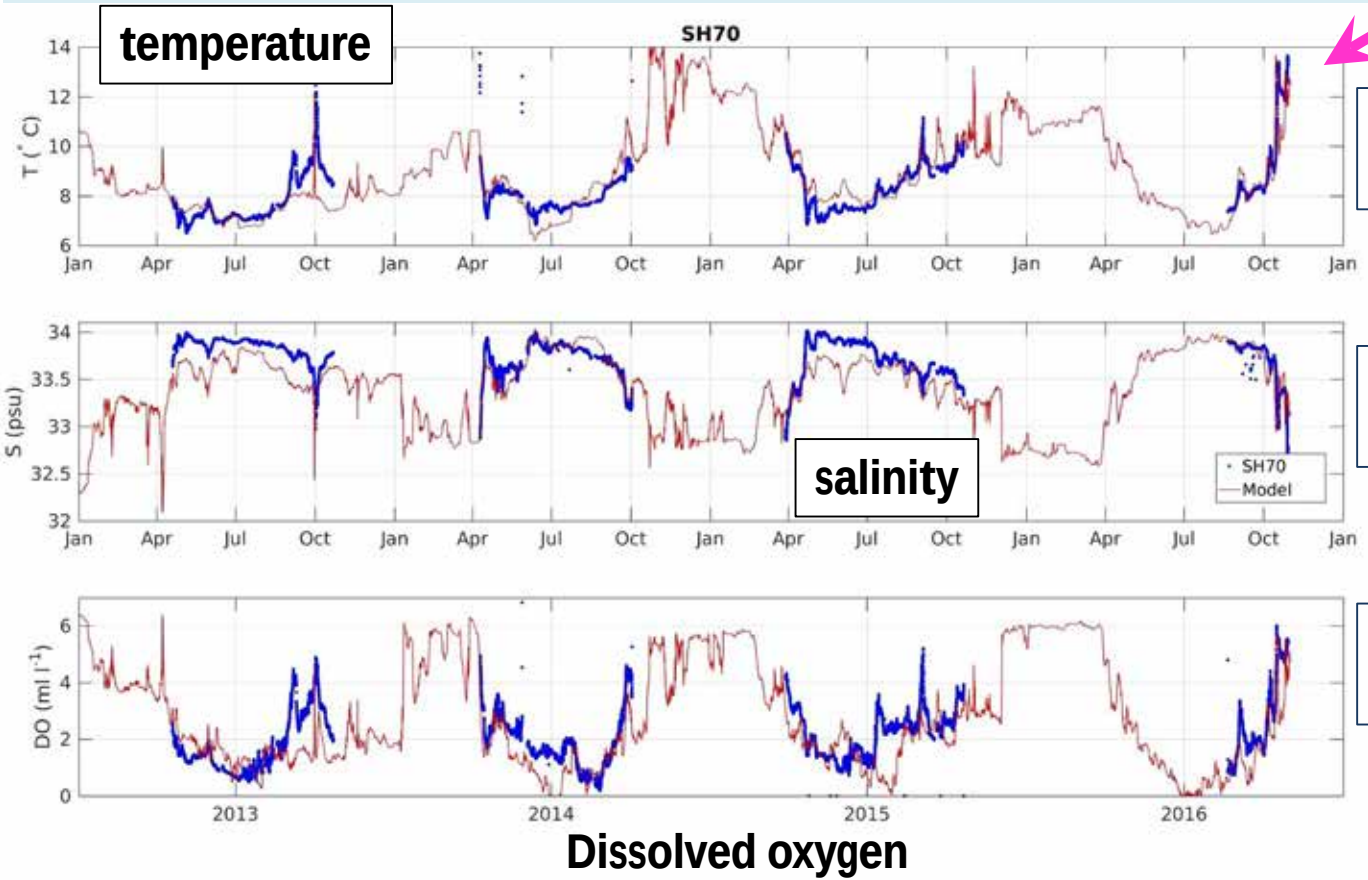
ROMS

3-Day forecast appears daily on NANOOS NVS



Model-Observation Comparison (Barth, Durski)

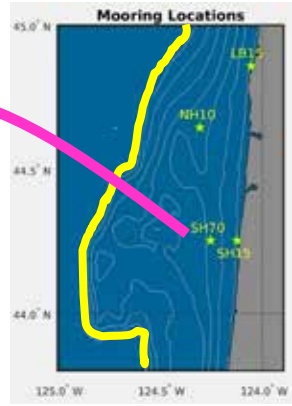
Mid-shelf, Heceta Bank mooring: T, S, Dissolved Oxygen



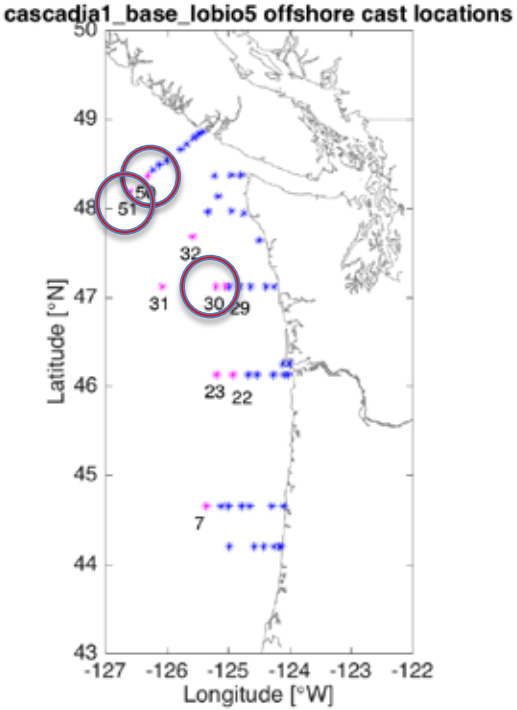
Corr.coef = 0.81
RMS diff. = 0.68
Bias(M-O) = 0.06

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

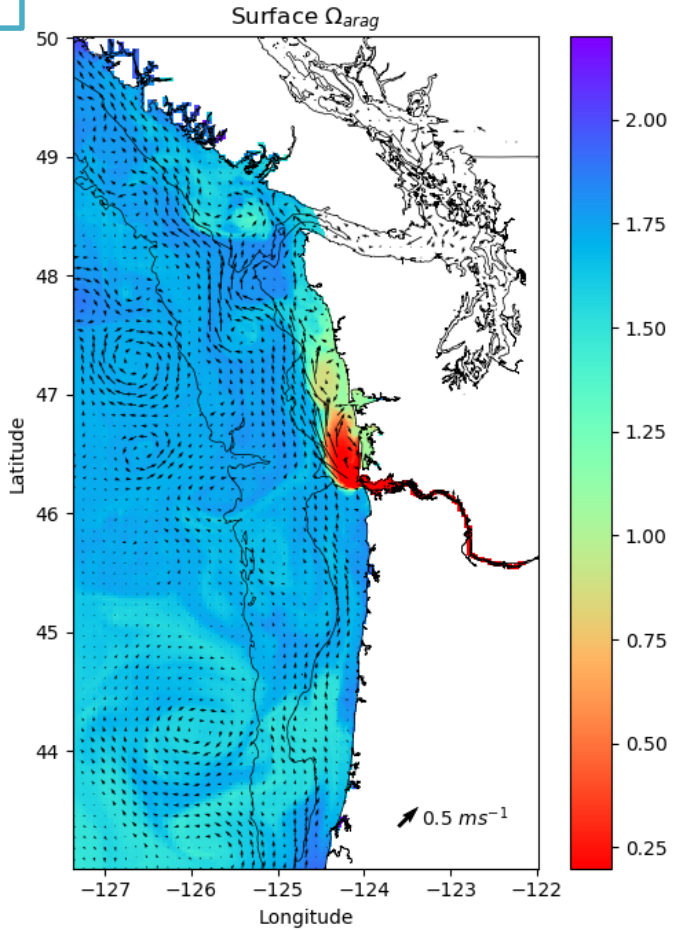
Corr.coef = 0.63
RMS diff. = 0.96
Bias(M-O) = -0.50

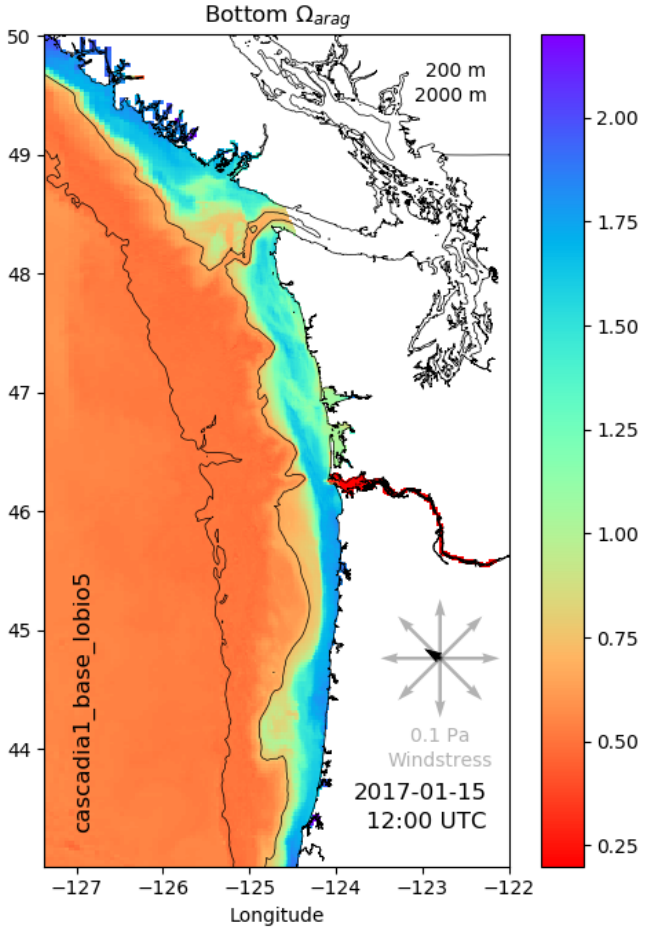


Chemical Validation: NOAA Casts 2016

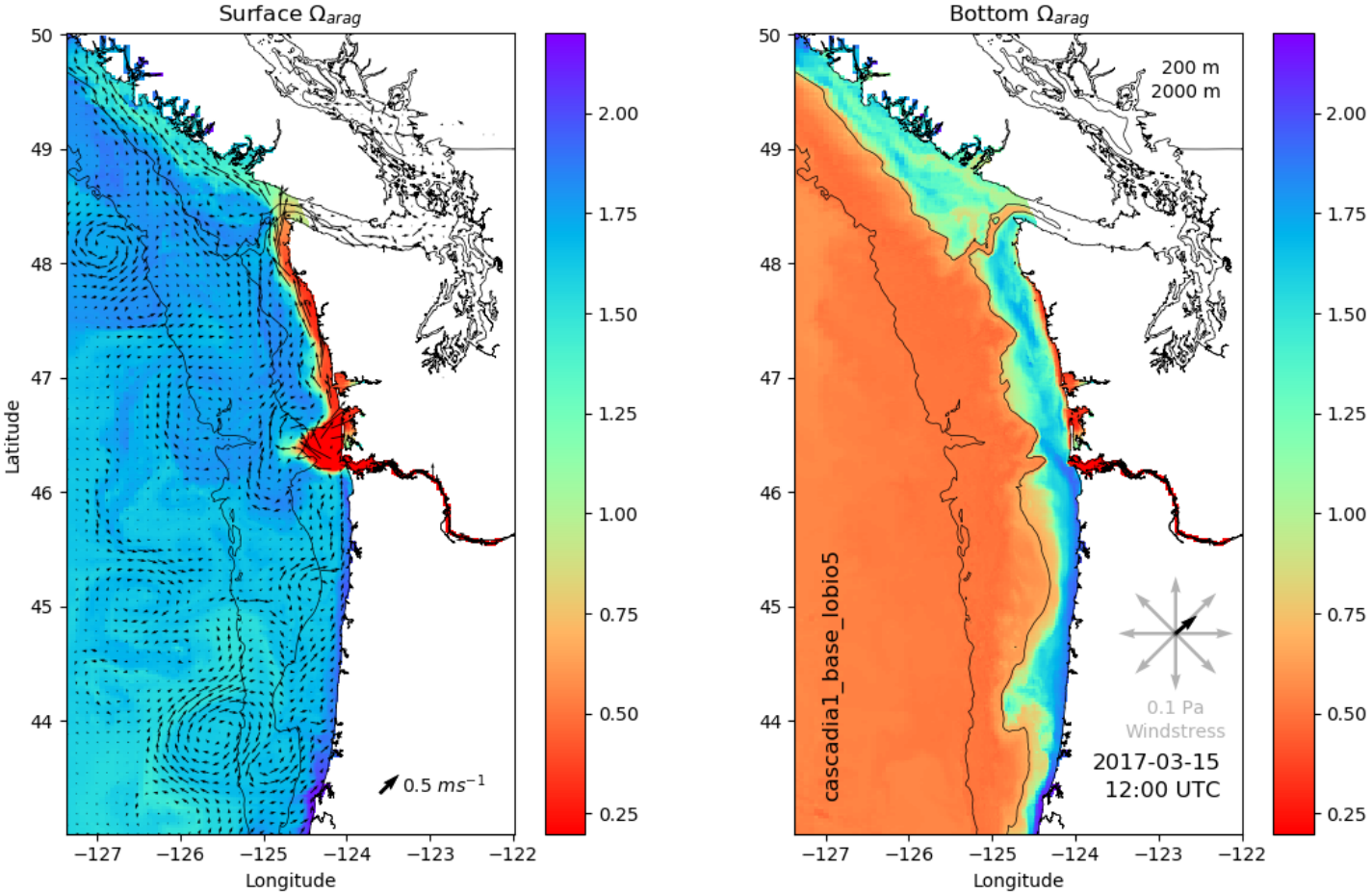


January


Surface Ω_{arag}
Latitude
Longitude
50
49
48
47
46
45
44
−127
−126
−125
−124
−123
−122
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.5 ms^{-1}


Bottom Ω_{arag}
200 m
2000 m
cascadia1_base_lobio5
0.1 Pa
Windstress
2017-01-15
12:00 UTC
Longitude
50
49
48
47
46
45
44
−127
−126
−125
−124
−123
−122
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25

March


Surface Ω_{arag}
Bottom Ω_{arag}
Latitude
Longitude
50
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−127
−126
−125
−124
−123
−122
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.5 ms^{-1}
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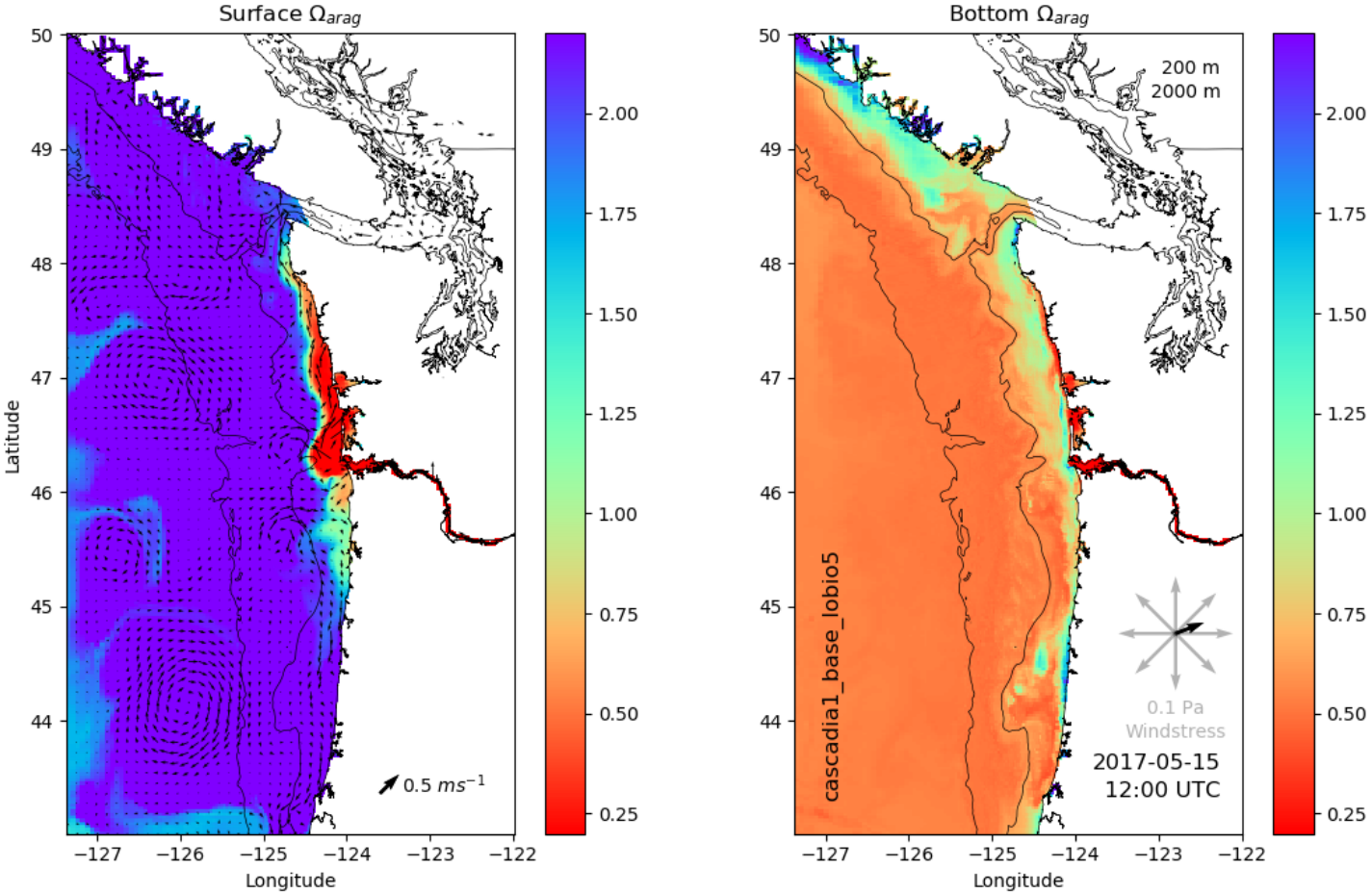
2000 m
cascadia1_base_lobio5
0.1 Pa
Windstress
2017-03-15
12:00 UTC

May


Surface Ω_{arag}
Bottom Ω_{arag}
Latitude
Longitude
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−127
−126
−125
−124
−123
−122
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.5 ms^{-1}
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2000 m
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0.1 Pa
Windstress
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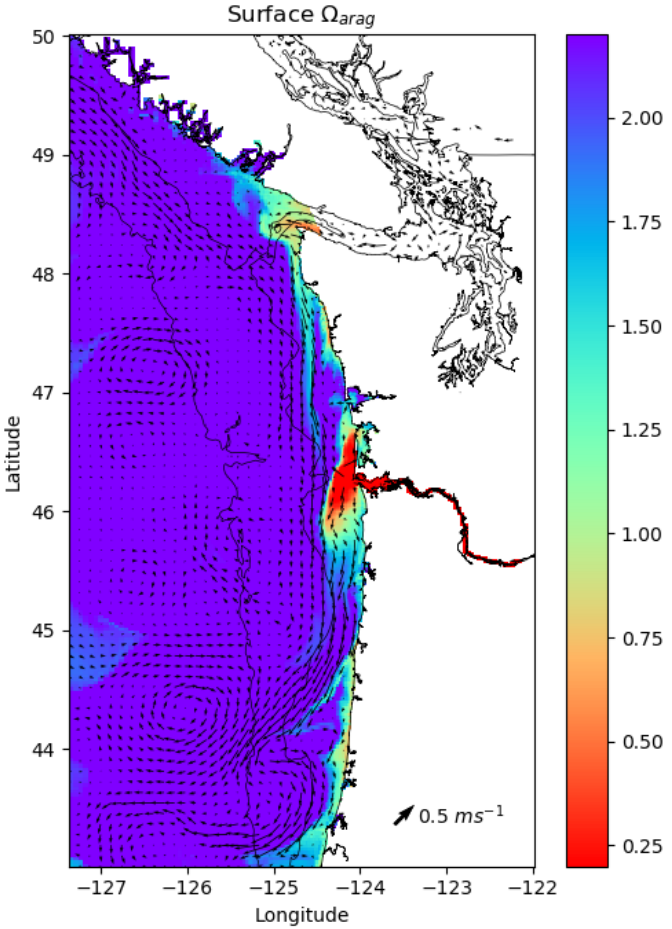
July


Surface Ω_{arag}
50
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45
44
Latitude
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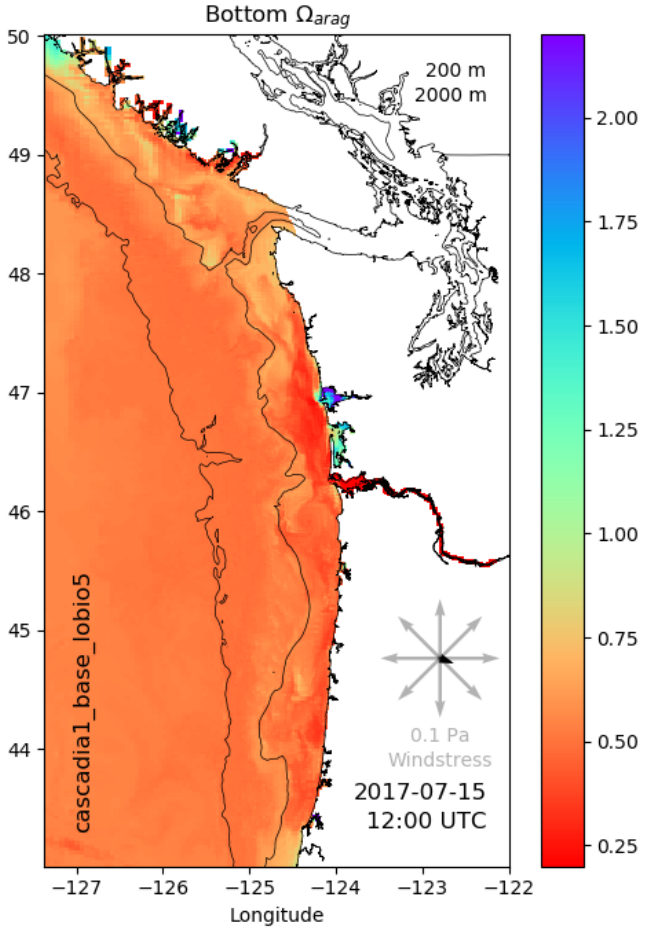
−125
−124
−123
−122
Longitude
0.5 ms^{-1}
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25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2000 m
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Windstress
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Longitude
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1.50
1.25
1.00
0.75
0.50
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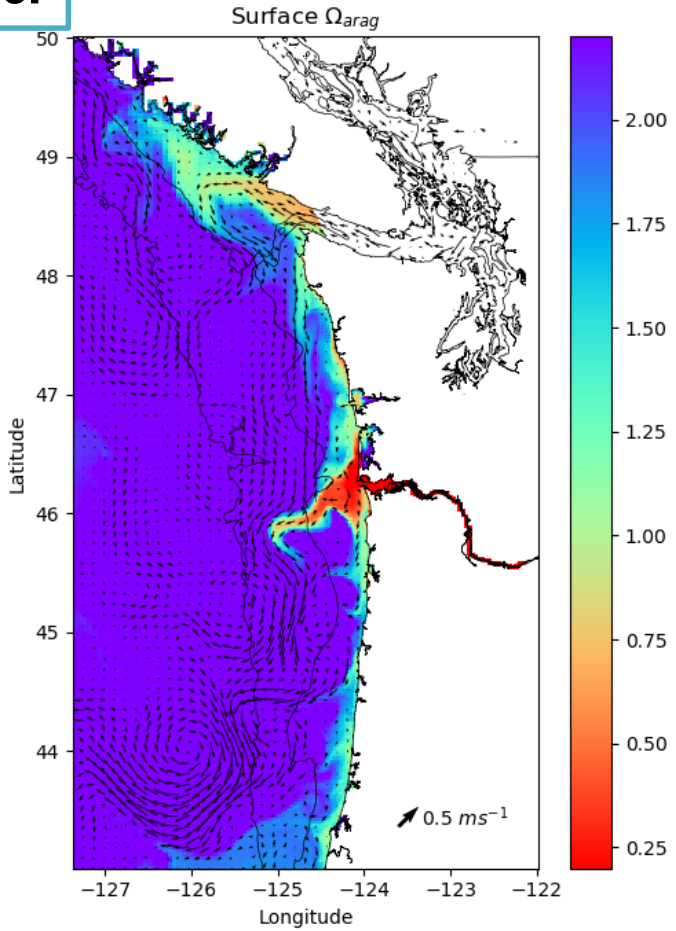
September


Surface Ω_{arag}
Latitude
Longitude
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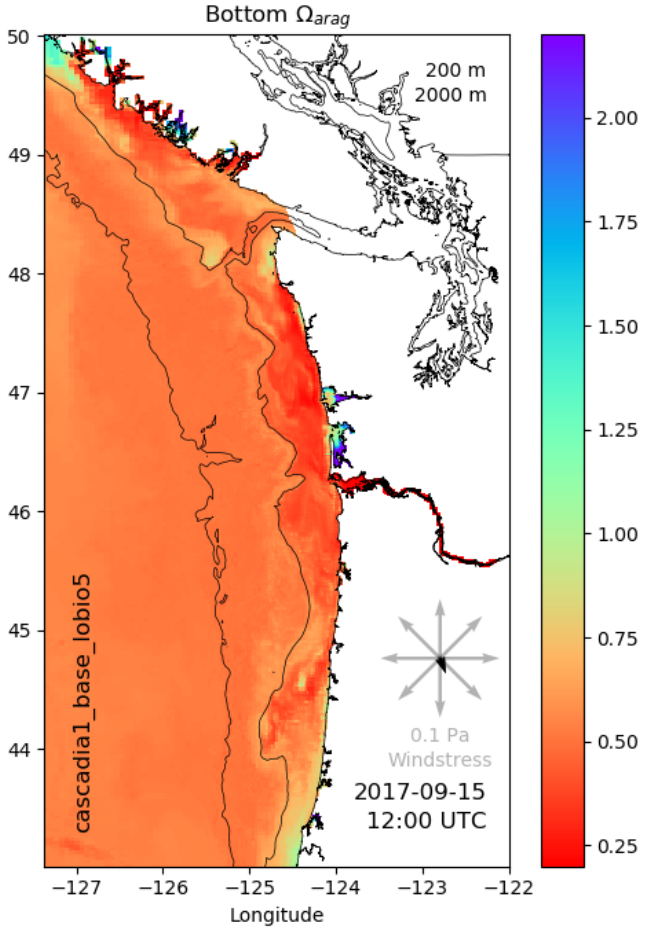
Bottom Ω_{arag}
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2000 m
cascadia1_base_lobio5
0.1 Pa
Windstress
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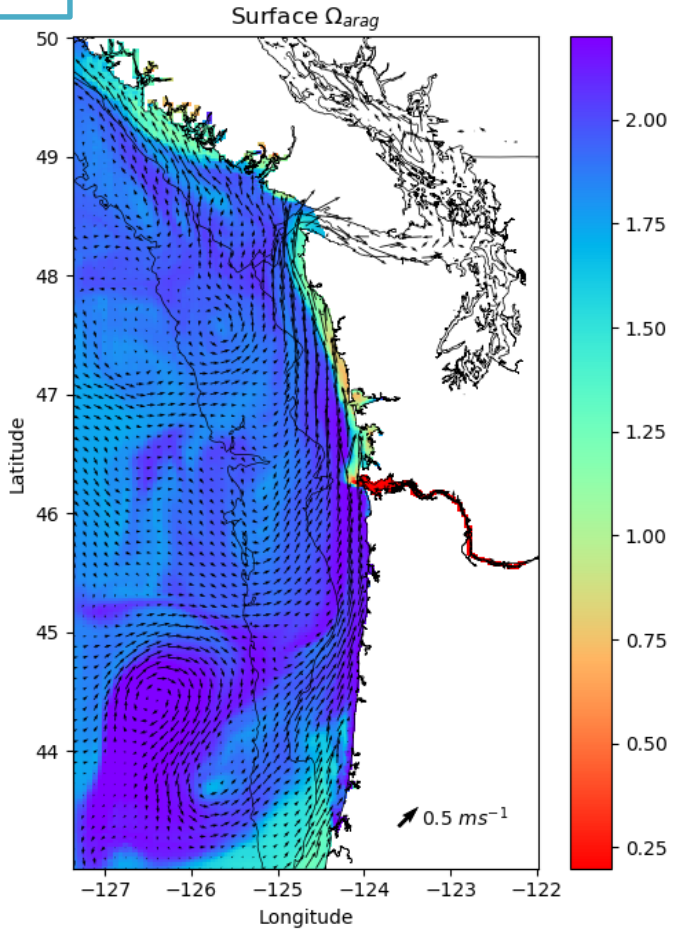
12:00 UTC
Longitude

November


Surface Ω_{arag}
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Latitude
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Longitude
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1.25
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0.75
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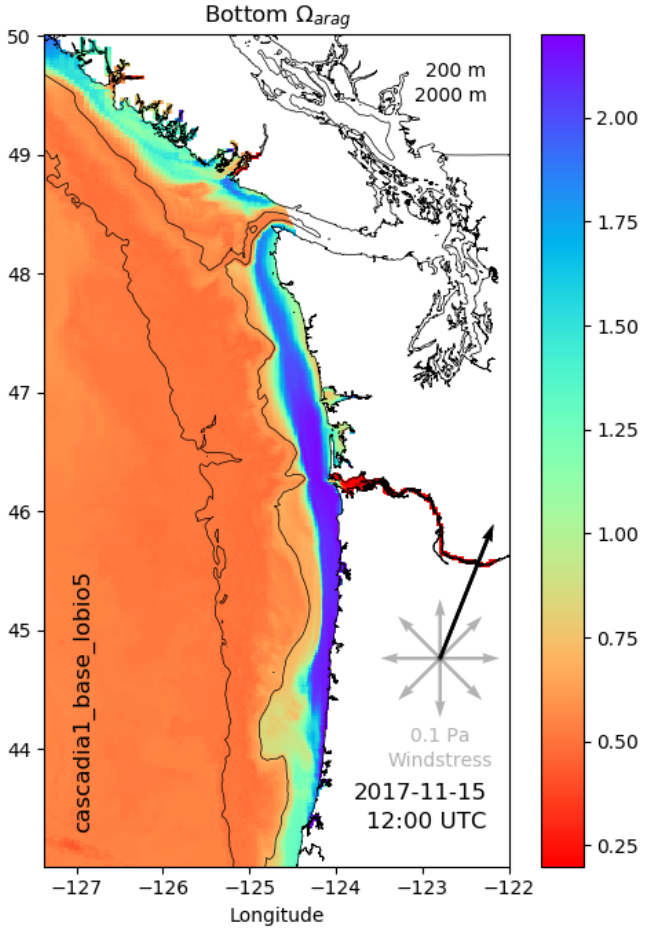
Bottom Ω_{arag}
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2000 m
cascadia1_base_lobio5
0.1 Pa
Windstress
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46
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44
−127
−126
−125
−124
−123
−122
Longitude
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25

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