Using OOI observations for the West Coast regional ocean model assessment

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Long-term observations is are needed for regional and coastal ocean circulation model skill assessment

Bigger computers => (A) opportunity to do longer simulations
(B) higher spatial and temporal resolution

$\Rightarrow$ Focus on interactions across a wide spectrum of temporal and spatial scales

- Shelf-slope-interior ocean interactions
- Interannual variability (decadal, climate)
- El Niño effects on the coastal ocean
- Tidal-nontidal interactions on the shelf and slope

**National Oceanic and Atmospheric Administration / National Ocean Service / Office of Coast Survey / Coast Survey Development Laboratory / Coastal Marine Modeling Branch*

The West Coast Ocean Forecast System (WCOFS):

(A) The operational system:

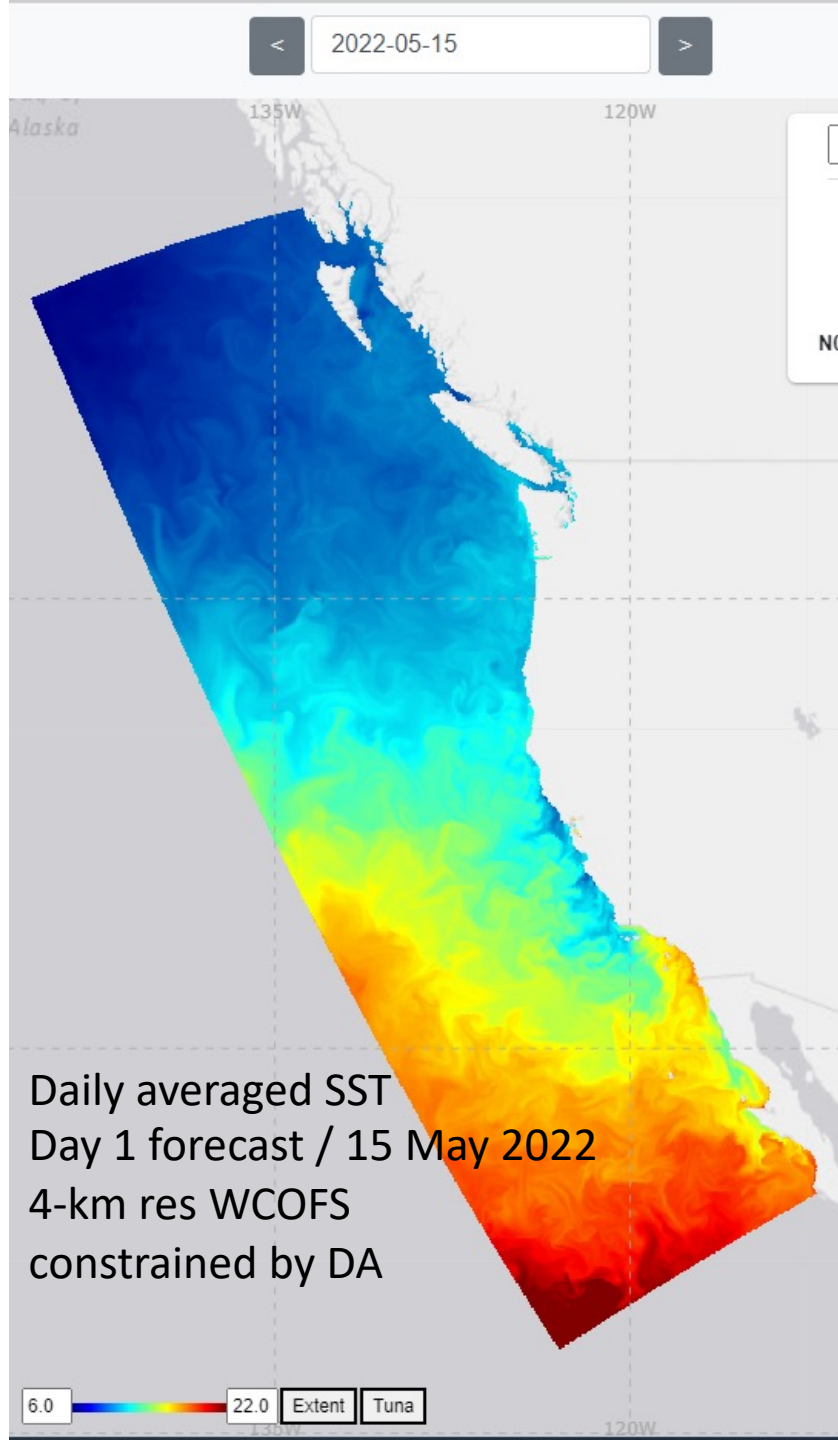
- 4-km horizontal resolution
- 4DVAR assimilation of HF radar surface currents, satellite SSH and SST
- providing 3-day forecasts of SSH, u, v, T, S

(B) The R&D ("Research & Development") model for future improvements (Kurapov et al., JGR, in review):

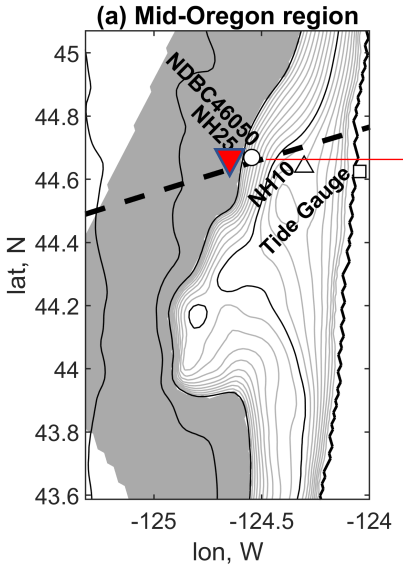
- 2-km resolution
- No data assimilation (free-run model)
- 2008-2018
- Realistic forcing (ERA5 atm forcing, tides, non-tidal boundary conditions, rivers: Columbia, Fraser, Puget S. inputs)

Comparisons to tide gauge SSH, mooring SST, glider and CTD, HF radar surface currents, shelf ADCP, bottom pressure*

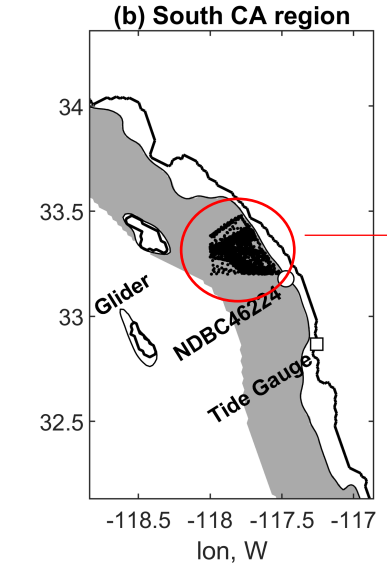
* OOI assets



Model skill assessment: depth of σ_θ=26.5 kg/m^3 over the slope



Red line: NH25 CTD, H=275 m (J. Fisher), 2+ week obs. frequency

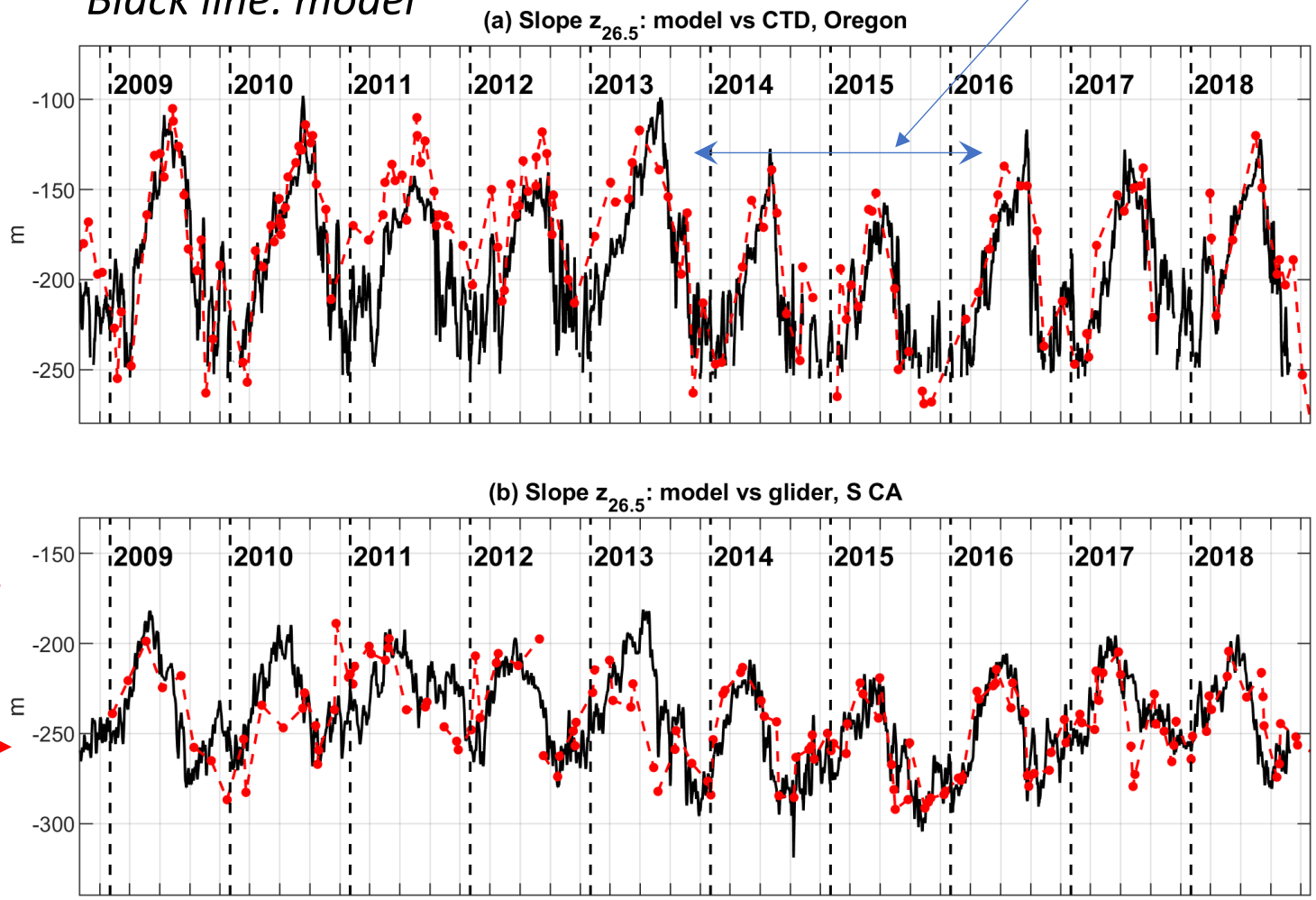


Red line: glider (Rudnick)

Data: ridded along the track

Black line: model

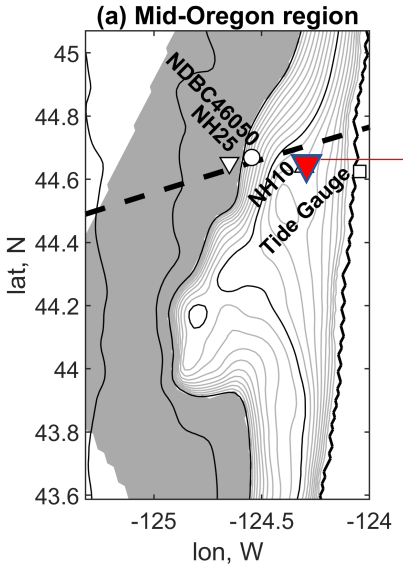
El Nino effect: depressed 26.5



T, S profiles (as well as u,v profiles) over the slope at a higher temporal resolution would be desirable

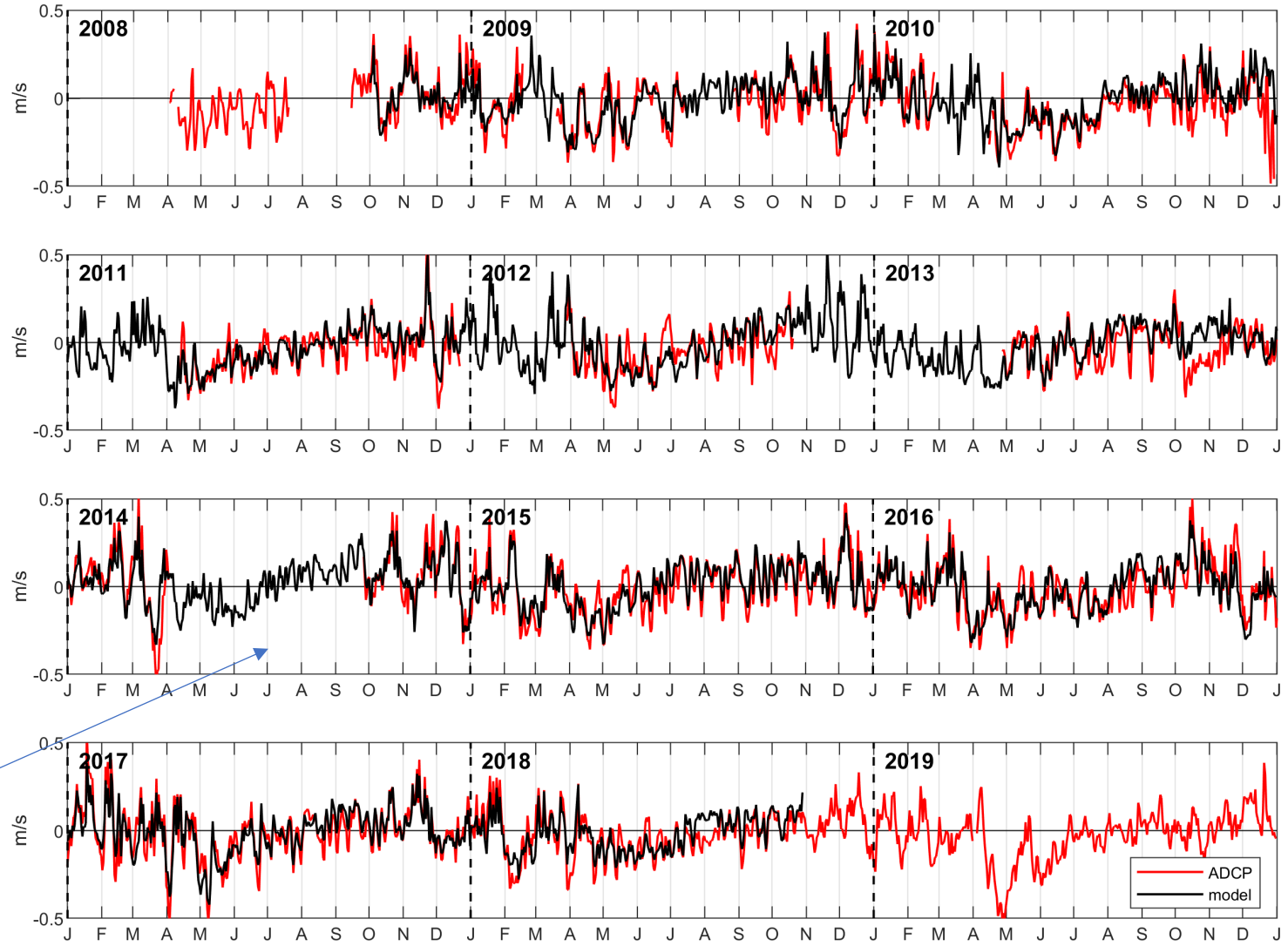
Assessments for the near-bottom current on the shelf:

The model compared against **NH10 ADCP**, H=81 m, daily-averaged, 10-20 m above the bottom



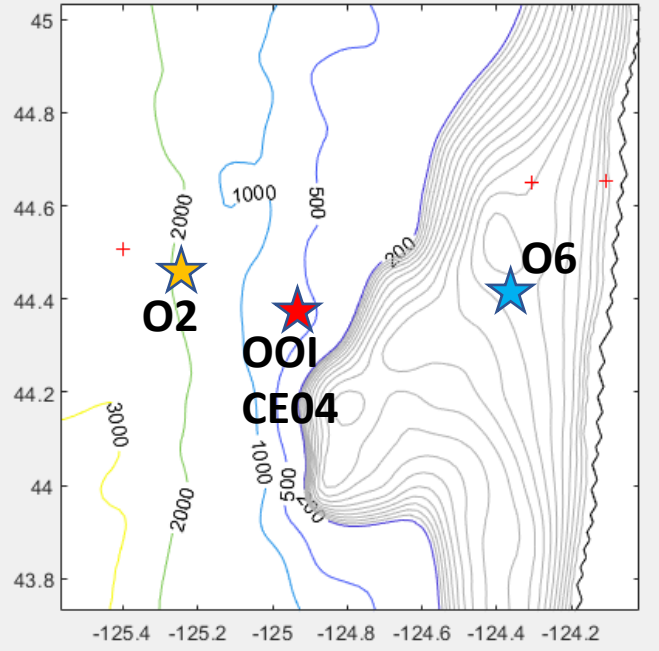
Red line: NH25 CTD, H=275 m (J. Fisher), 2+ week obs. frequency

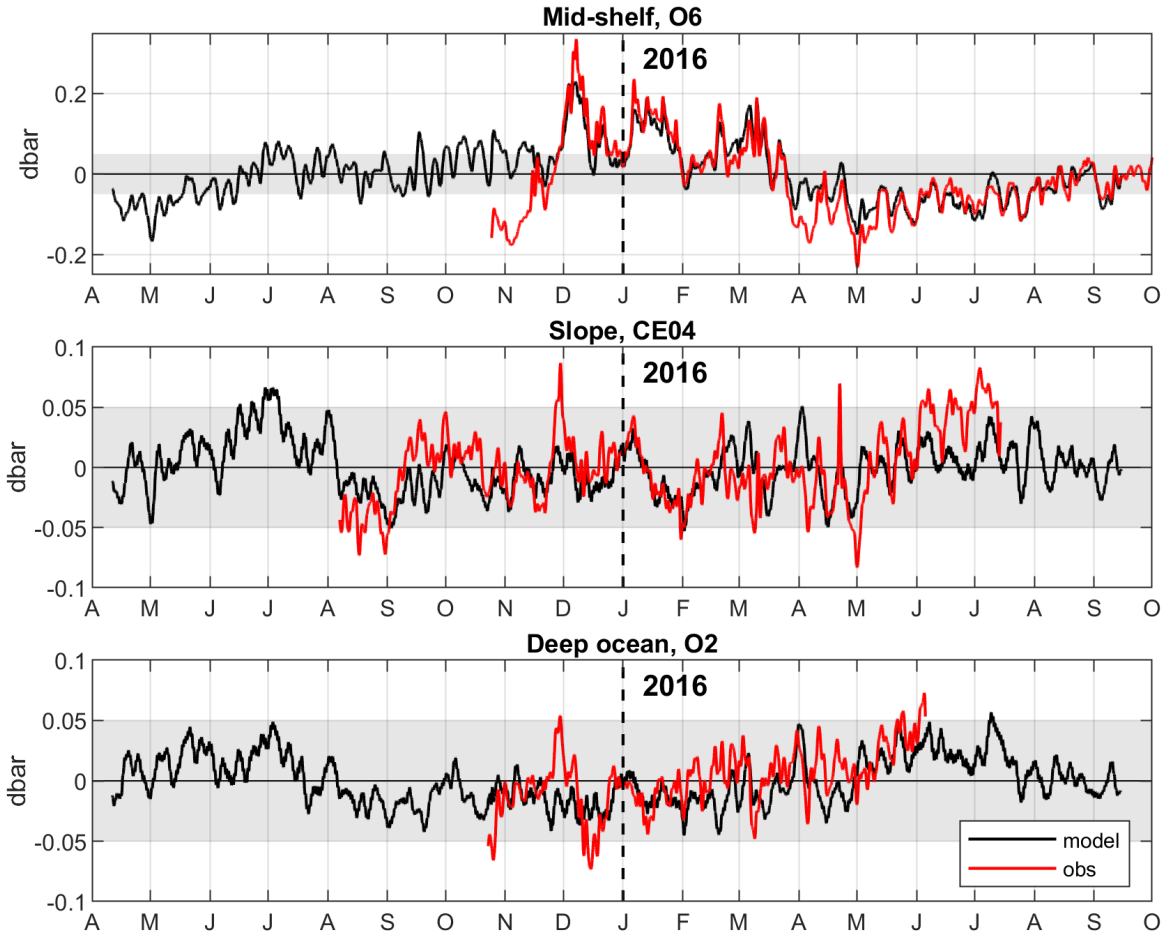
- This data set is part of the long-time monitoring effort (Levine, Kosro, others)
- Since Sept 2014: OOI
- The gap in Apr-Sep 2014 (right when the warm blob was approaching the Pac NW coast)



Bottom pressure analyses (w/ MacCready, Fredrickson, Wei, Wilcock)

- understand the oceanic signal in the bottom pressure data, intended for use in geophysical applications (such as detection of “slow slip events”)





Summary:

- OOI data sets present a tremendous opportunity for oceanographic research with a focus on interactions across a spectrum of temporal and spatial scales
- Model-observation synthesis (comparative studies) proves to be a very useful approach

Discussion points:

- Maintain and preserve long-term data sets. Expand coverage. Save historic data.
- Inventory: OOI and non-OOI (allow the researcher a quick grasp on what is available)
- Convenience of downloading, data aggregation: by analogy with satellite data, provide Level 2, Level 3, Level 4 data
    - The example with gliders:
        - L2: along the zigzag path/individual profiles,
        - L3: mapped along the track (with gaps) (such as the set avail. at D. Rudnick's site)
        - L4: projected on the straight average path (optimal interpolation in space and time)