SYMPOSIUM OP'24 ADVANCING OCEAN PREDICTION SCIENCE FOR SOCIETAL BENEFITS

Theme #2

Near-surface salinity improvements in the US West Coast Ocean Forecast System (WCOFS)

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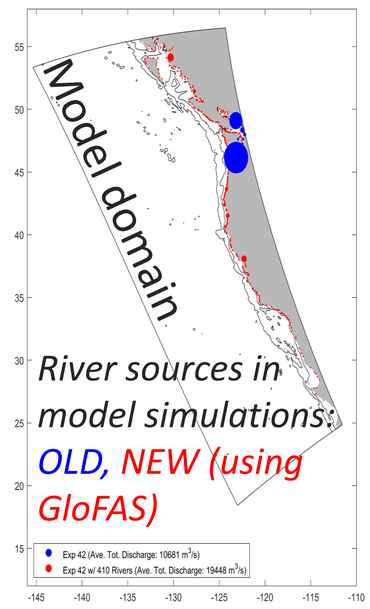
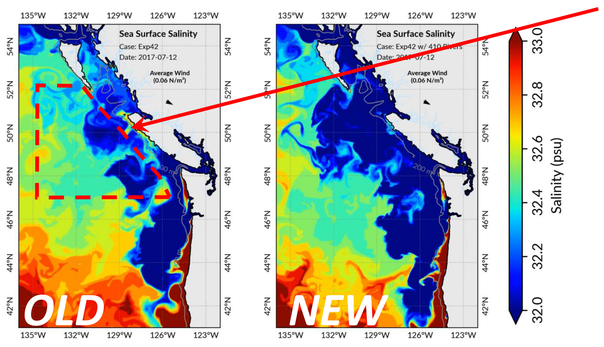
Goals: (1) Demonstrate the impact of the land-shelf-interior ocean interactions on the sea surface salinity (SSS) in the coastal transition zone (CTZ), esp. off British Columbia, Canada. (2) Compare satellite SMAP SSS to Argo and the model. (3) Understand mechanisms driving near-surface salinity variability

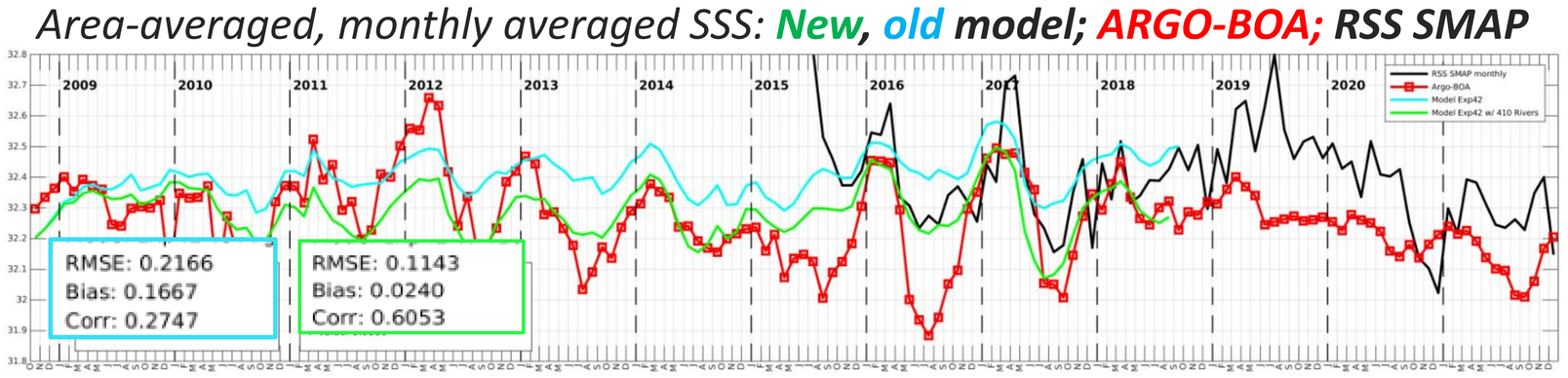


WCOFS: Based on ROMS, resolution 2-km / 40 layers
Presented here: 2008-2018 simulations, no assimilation. Forcing: ERA5, tides, HYCOM b/c
OLD simulation: limited river discharges (Columbia, Fraser, limited Puget Sound sources)
NEW simulation: all the sources from GloFAS ⇒ SSS improvement in the CTZ

Model SSS: 12 Jul 2017

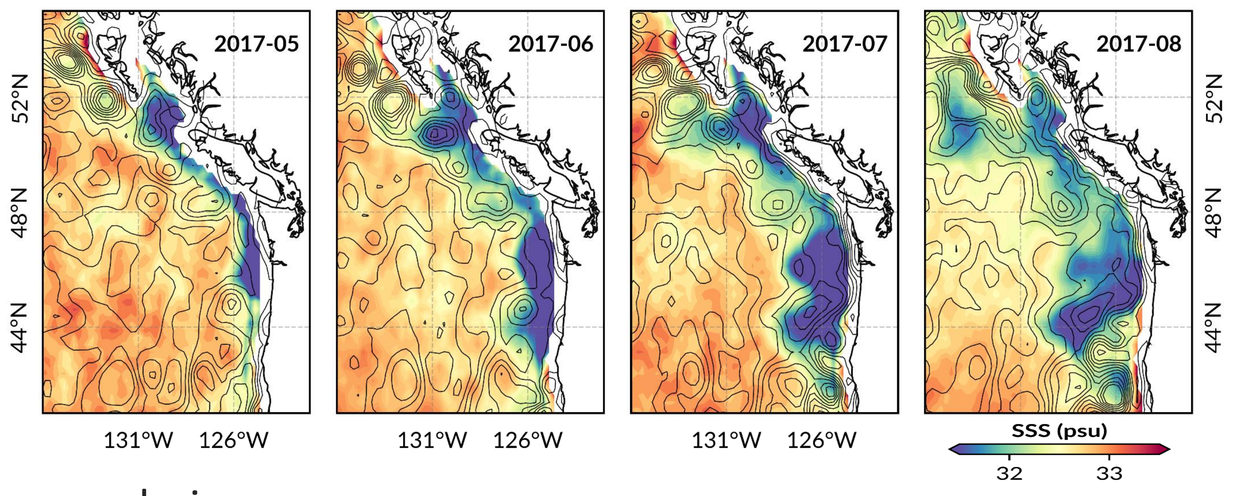


*Area-averaged, monthly averaged SSS: **New**, **old** **model; ARGO-BOA; RSS SMAP***



Mechanism: entrainment of fresher water (of terrestrial origin) by the large eddies, *demonstrated here using satellite data*

Contours: CMEMS Sea Level Anomaly L4 (every 2.5 cm), color: SMAP SSS (both monthly)

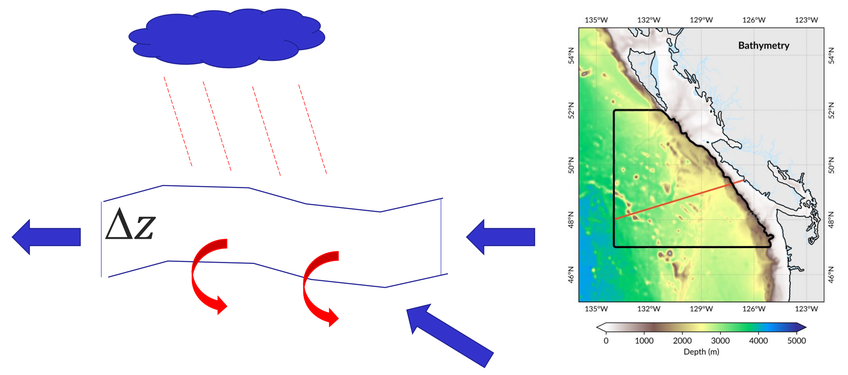


What controls near-surface salinity variability?

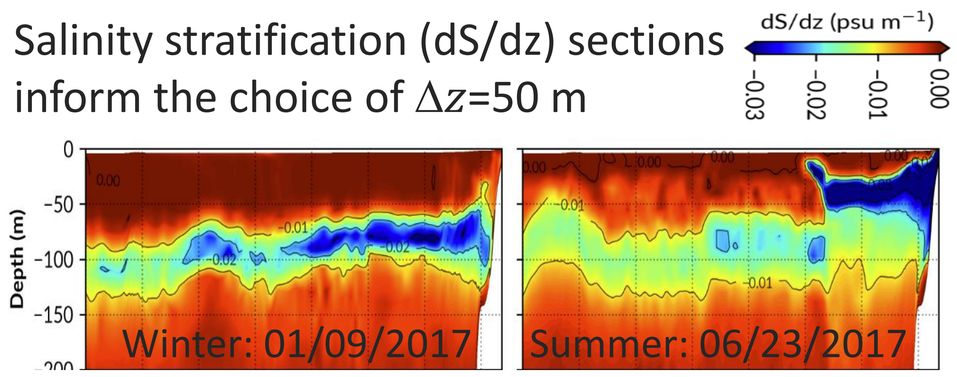
- Perform model volume-averaged $\langle S \rangle$ term balance analysis
- The volume: our control area (CTZ off Vancouver I.) x top Δz m

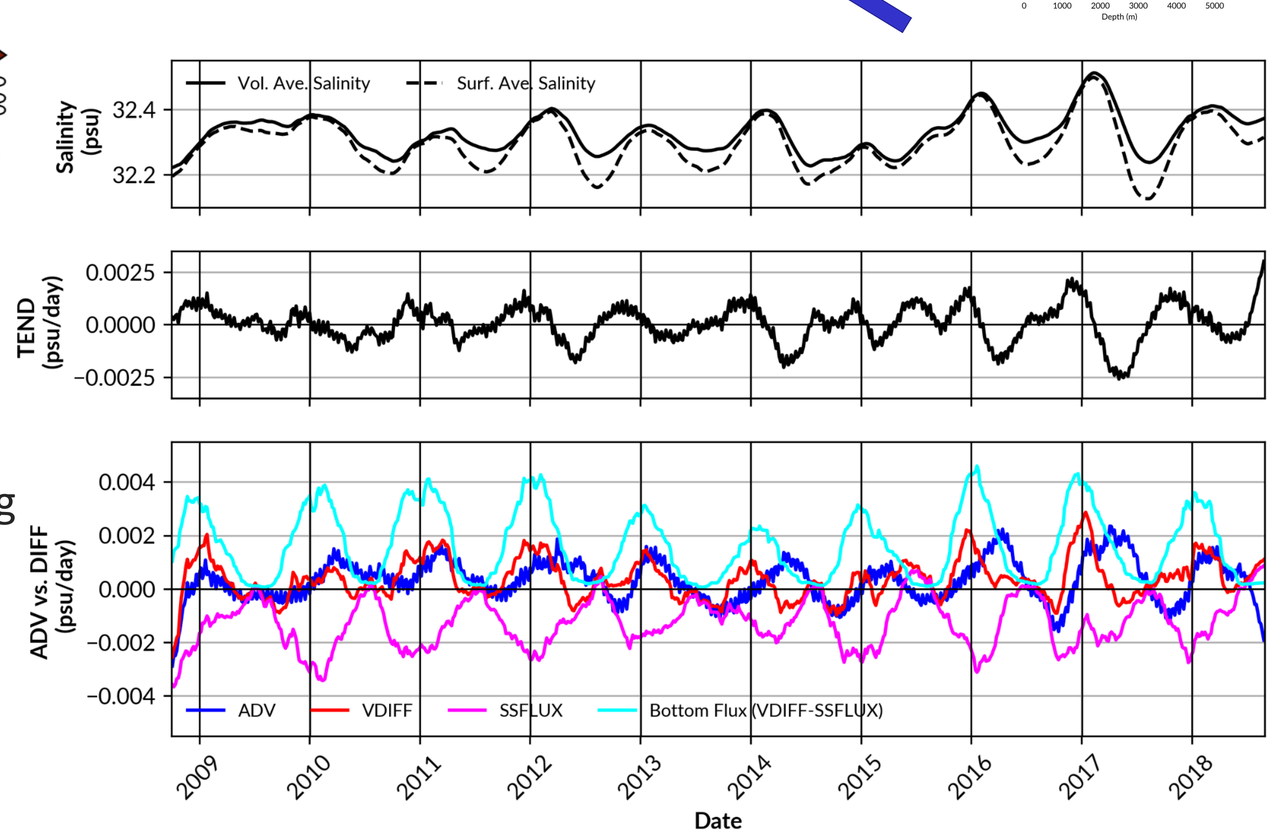
$$\frac{d\langle S \rangle}{dt} + \langle ADV \rangle = \langle VDIFF \rangle$$

$\langle VDIFF \rangle$ = surface flux [*SSFLUX* = S_{surf} (E – P)] – mixing @ bottom of the slab



Salinity stratification (dS/dz) sections inform the choice of Δz=50 m





- 2016, 2017: a larger SSS winter-summer contrast than in other years, driven by a strong ADV of terrestrial waters into the CTZ domain
- Precipitation is important
- 2015: E-P>0 in summer (marine heat wave) drives the summer anomaly in SSS

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