
WELCOME
DAY 11

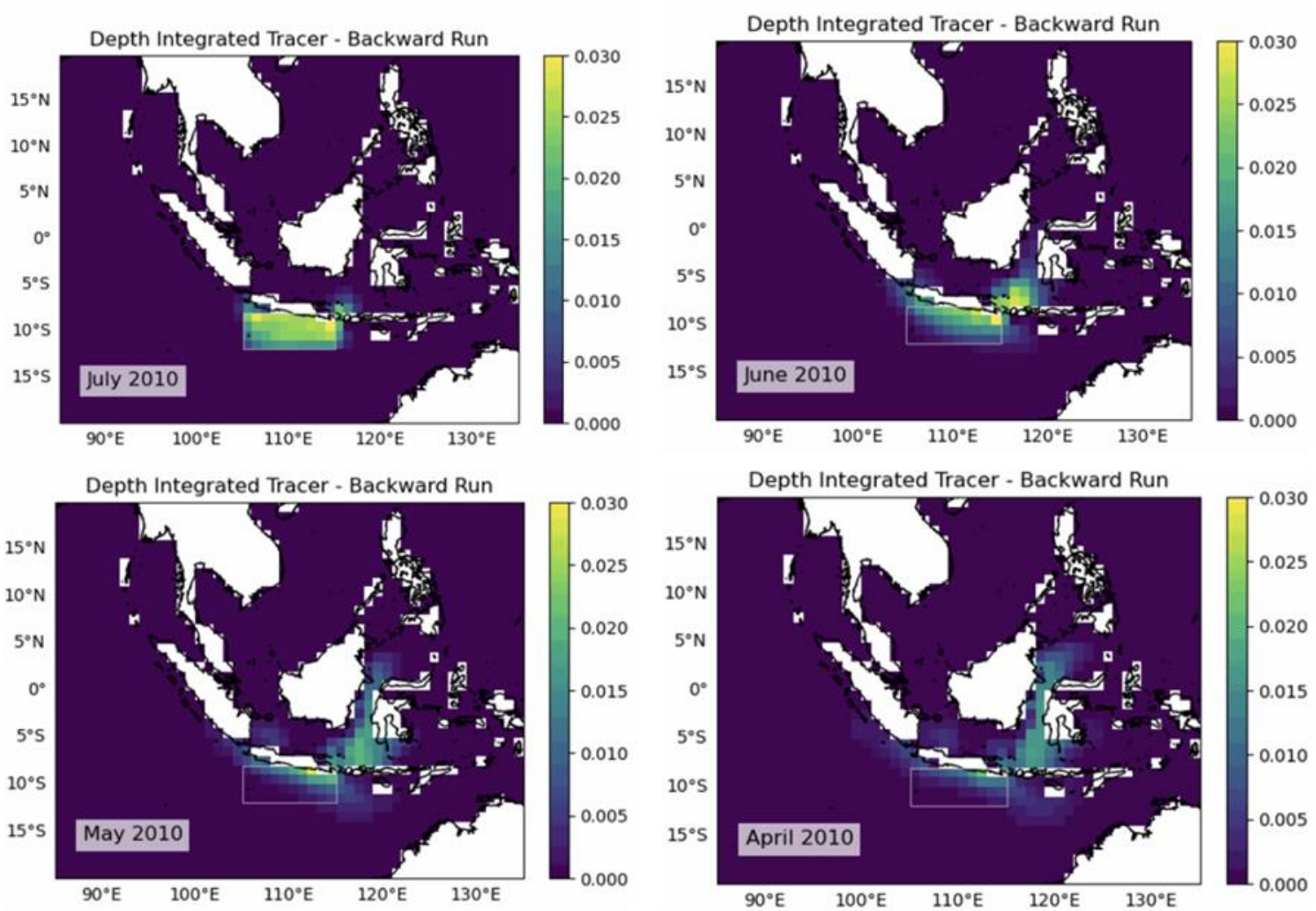
ECCO-UP

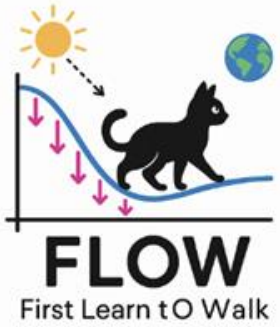
Progress:

- Plotted tracer adjoint runs!
- Got very confused about a lag in the convolution reconstruction

To-do:

- Make slides
- Solve convolution issue???



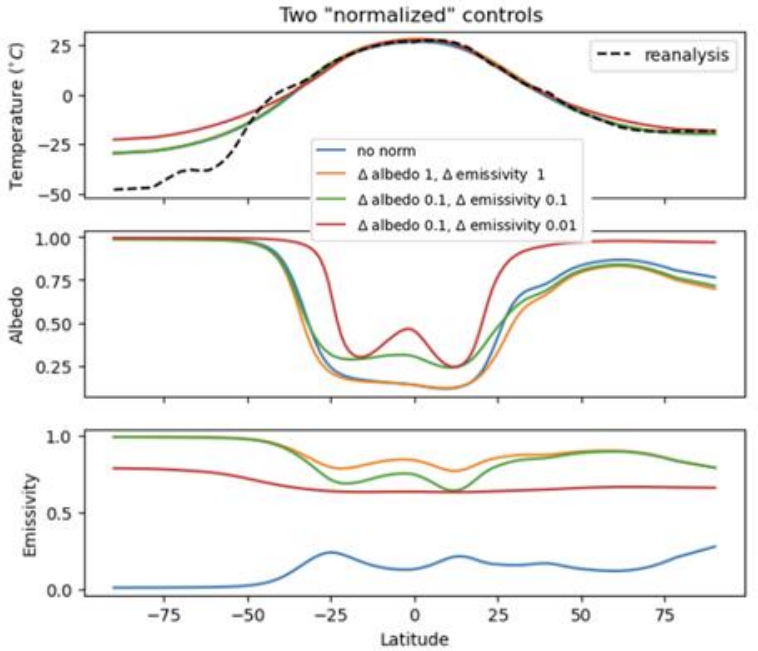


Karina Ramos Musalem, Noah Rosenberg

Project goal: Do a small state estimation by building on Budyko-Sellers proof of concept

Thursday 5-29 Status

- Cleaned up Jupyter notebook and made self-contained to run as tutorial
- Debugging: Added complexity broke gradient descent (note to self: git commit more often)
- Implemented line search to improve gradient descent
- Begun ECCO-style nondimensionalization of adjoint gradients but something's off?



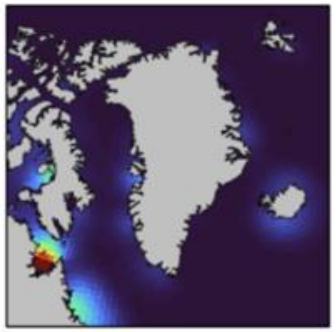
Next Steps:

- Continue exploring control normalization.
- Generate two tutorial notebooks
- Finish debugging L-BFGS and line search
- Make everything pretty

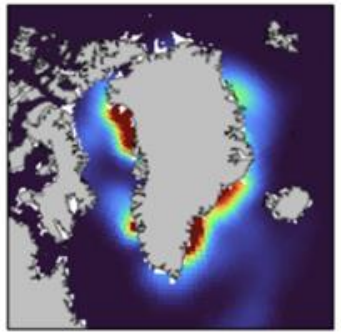
ICEUP

Iceberg **C**ontribution for **E**CCO **U**pdate and **P**erformance

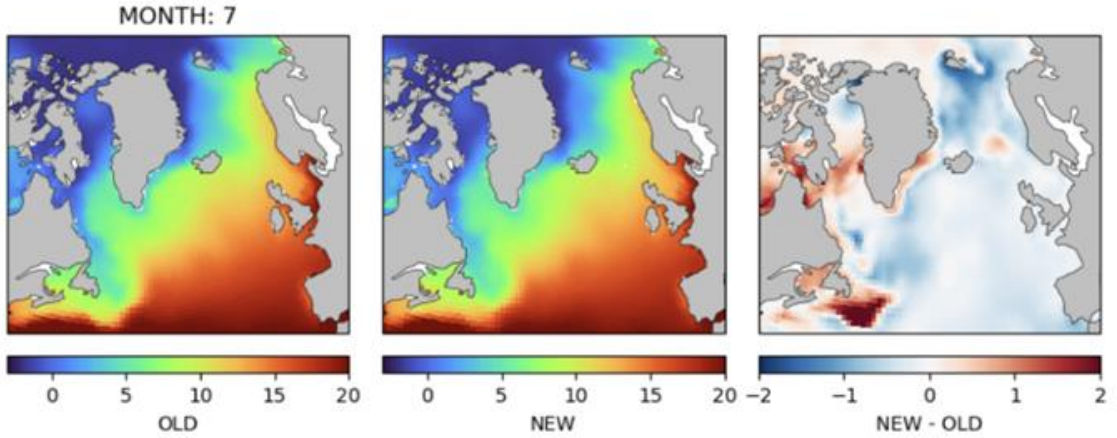
OLD



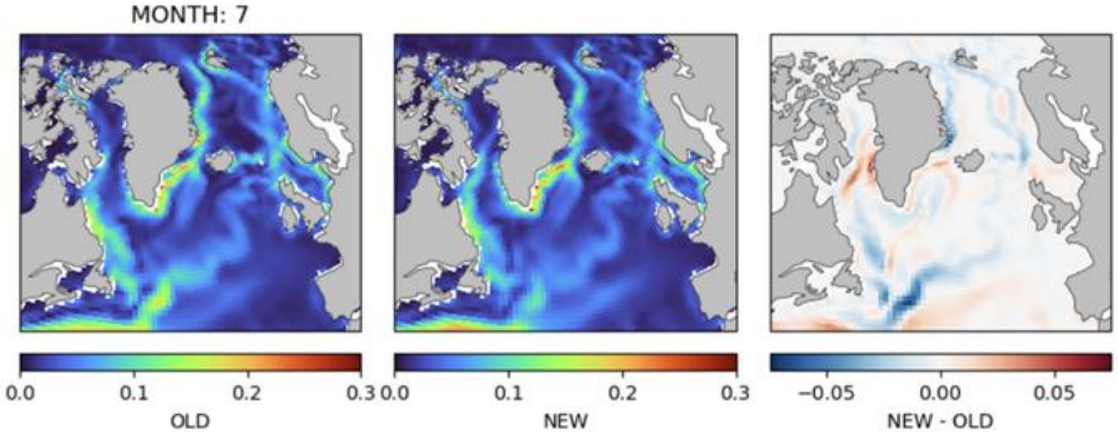
NEW



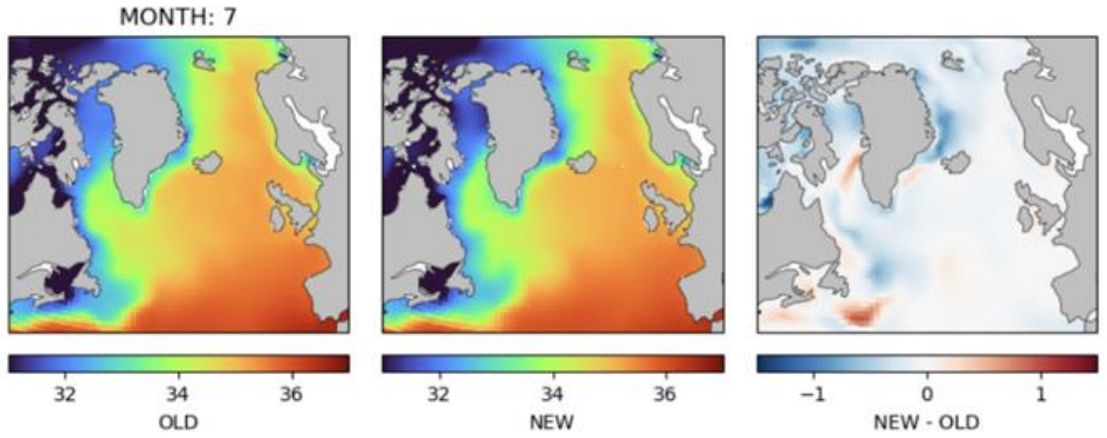
Temperature



Velocity

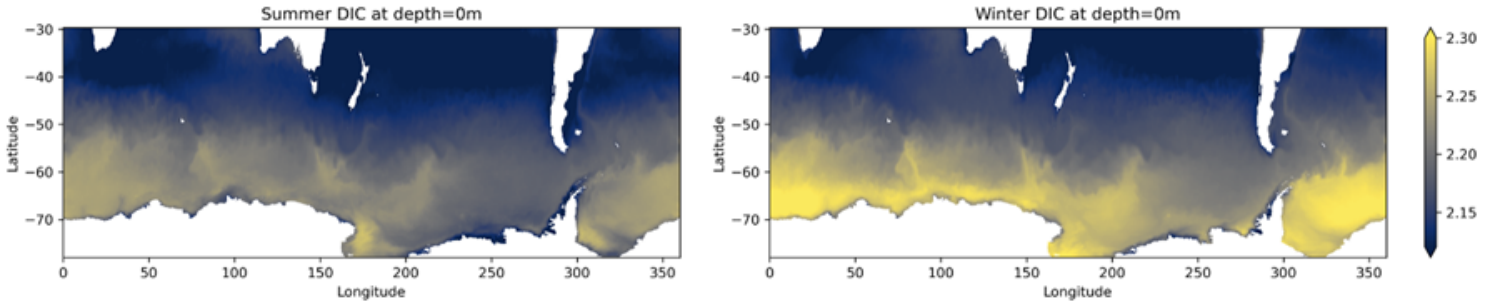


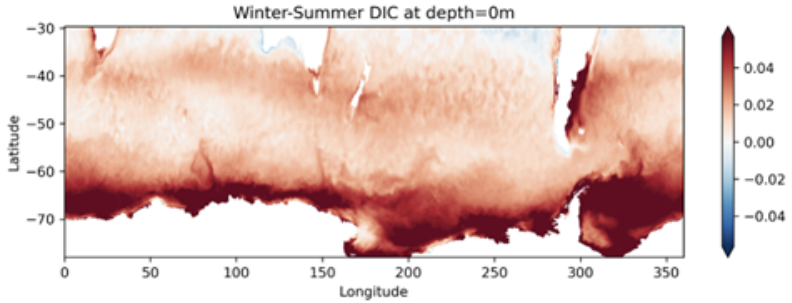
Salinity



Anna Lo Piccolo

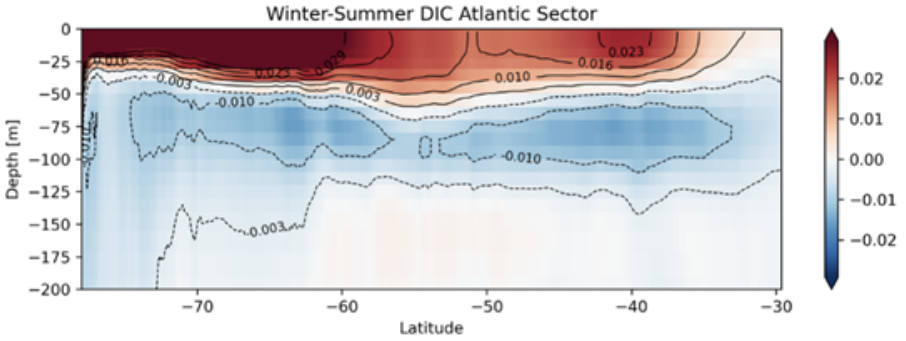
Frontal **T**ransport of Tracers in the Southern Ocean (**FRONT**)





Evaluated DIC in the Atlantic sector:

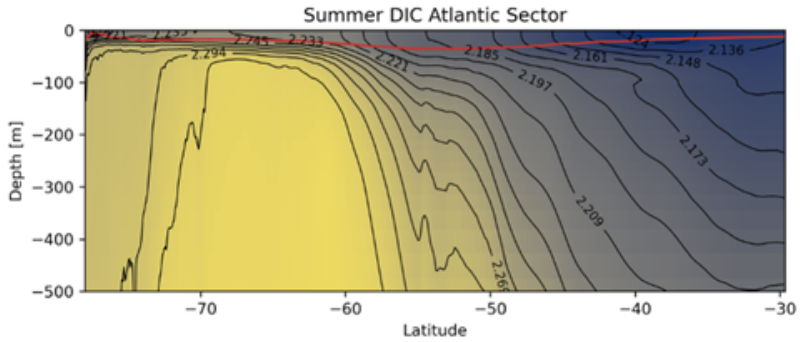
- Seasonality of meridional distribution
- Guessed relationship with mixing
- ADVrDIC is very scattered

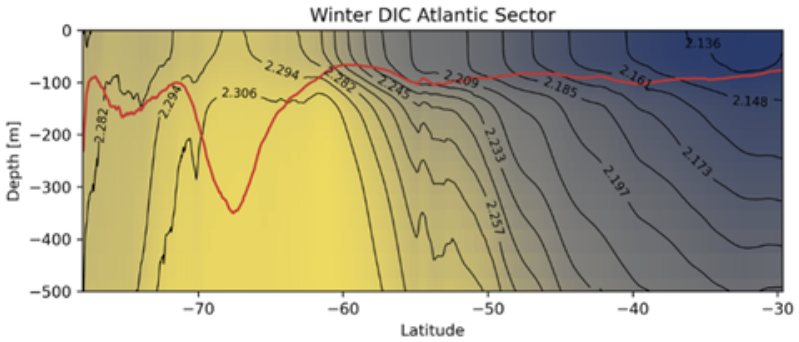


- Upper water well mixed in winter brings high DIC at the surface

DIC seasonality:

- Computed for different depths
- Ocean gets more DIC in winter
- More surface DIC in winter, especially at low latitudes
- But not trivial with depth!





Corrected DIC, Temp, Salt in Atlantic sector:

- Stay tuned!

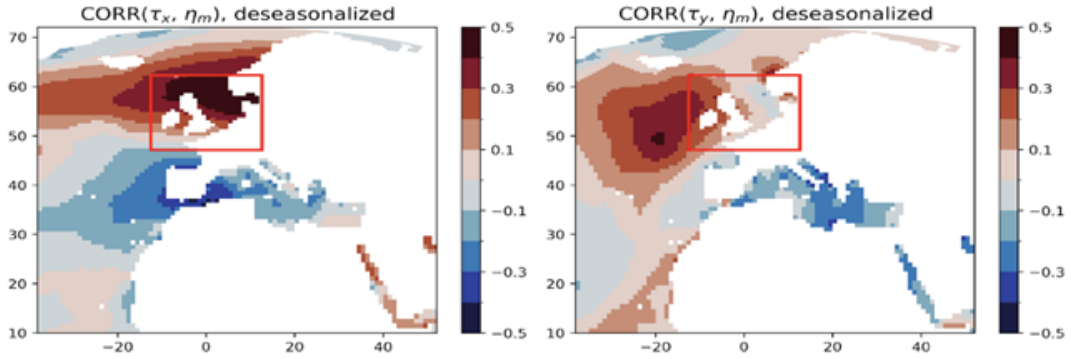
Plan for today:

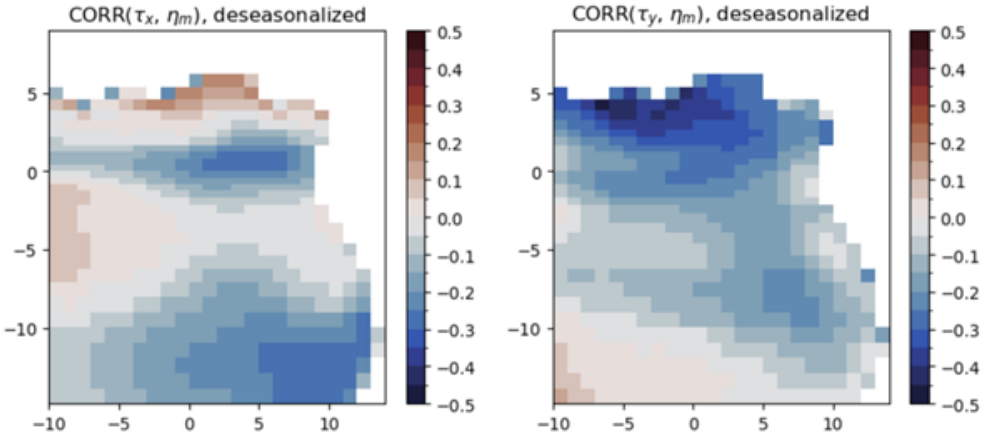
- Evaluate correlation with isopycnals
- Think about eddy fluxes of DIC
- Think about relations with fronts: they can be misleading, how is their seasonality?

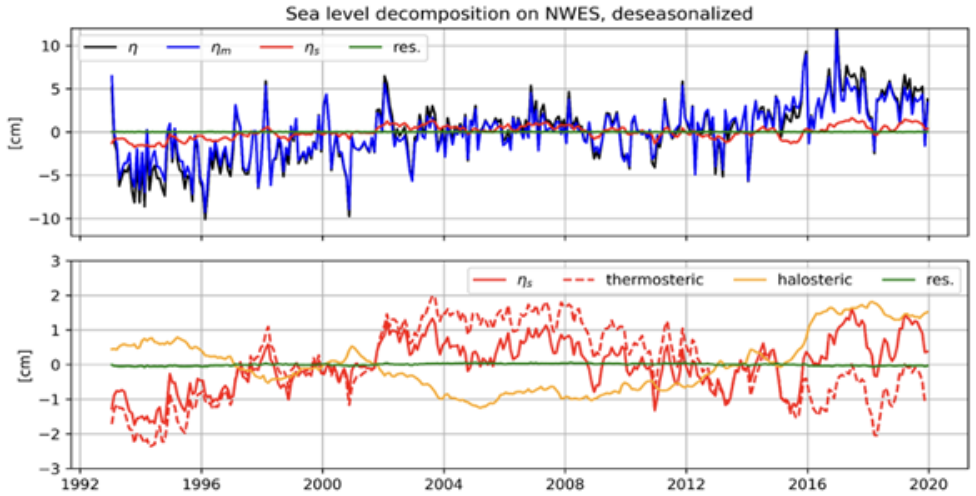
Physical Processes Impacting Regional Sea Level (PISeaL)

Yueyang Lu, Odilon Houndegnonto

Northwestern European Shelf Sea Level (NWSL) and Gulf of Guinea Sea Level (GGSL)



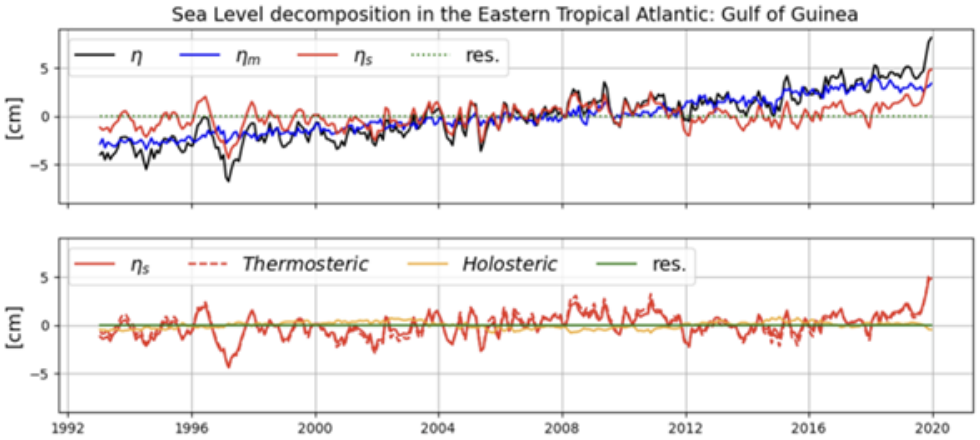




$$\eta = \eta_m + \eta_s = \frac{p_b}{\rho_0 g} - \frac{1}{\rho_0}\int_{-H}^{0}(\rho - \rho_0)\,dz^*$$

To do today

- Deepen the analysis
- Github page
- Final Slides



- NWES sea level is dominated by the manometric part (mass variation)
- Steric part is dominated by the thermal effect
- η_m on NWES is correlated to the zonal (meridional) wind stress at the northern (western) boundary → explained by the Ekman transport mechanism (not new in NWES region)

- The manometric component exhibits the same linear trends as the sea level anomalies, whereas the observed sea level anomalies are dominated by the steric component variation.
- The steric part in dominated by the thermosteric changes.
- The manometric component: is mostly anticorrelated to the surface with stress (?) except in the bay of Benin (?).

Adjoint Sensitivities & Heat/Volume Budgets in ECCO for RegionaL Investigation Over the California Current System (SHERLOCCS)

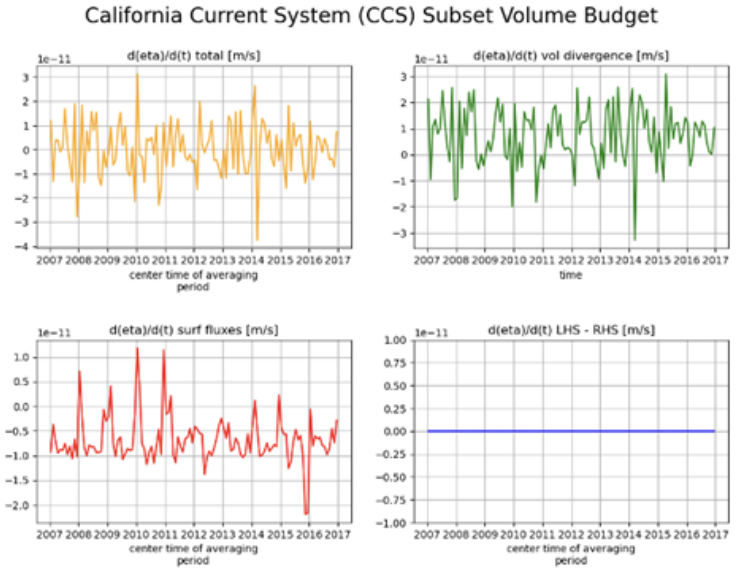
PROJECT UPDATES; MAY 29

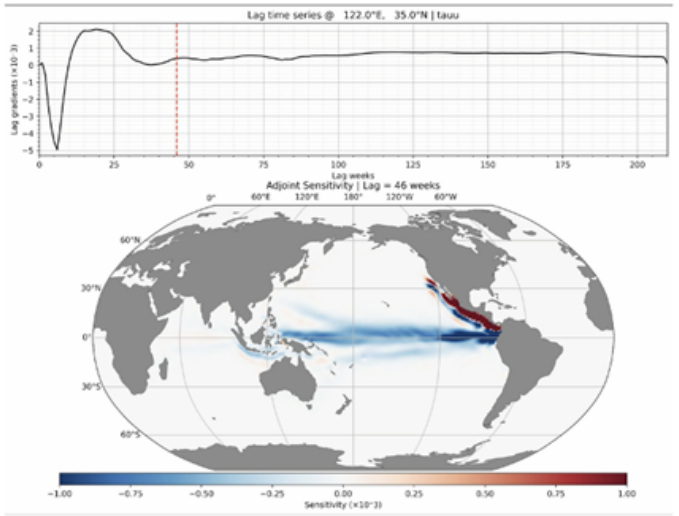
SUMMARY; MAY 28

- Closed volume budget for model domain
- Obtained adjoint gradients for temperature anomalies & visualized sensitivities to various forcings
- Completed heat budget comparisons for surface & subsurface layers

THE PLAN; MAY 29

- Multiple jobs (forward run, adjoint sensitivity to SSH, & more!) running on the server–will analyze results as they arrive
- Separate horizontal & vertical flux divergence contributions to volume budget → compare to Zaba et al.
- Compare time scales–adjoint sensitivities to SST & equatorially-generation Kelvin wave propagation
- Begin putting "poster" & slides together





Caeli Griffin, Anthony Meza, & Yue Wu

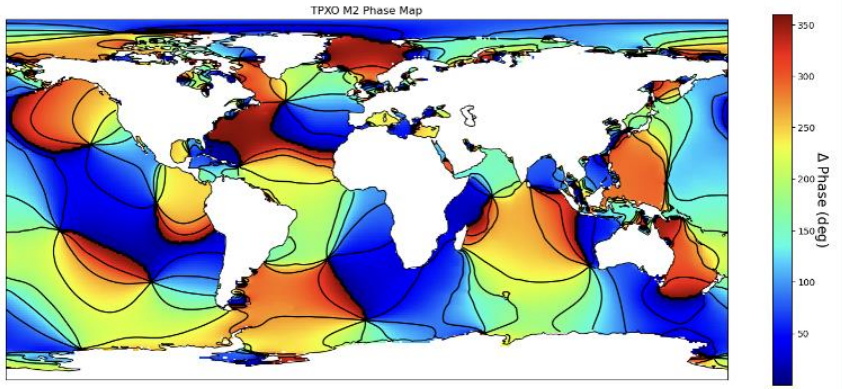
TURN ON THE TIDES (ToTs)

Hinne Van Der Zant, Hugo Plombat, Rebecca Zaja, Yumi Abe, Clément Bertin

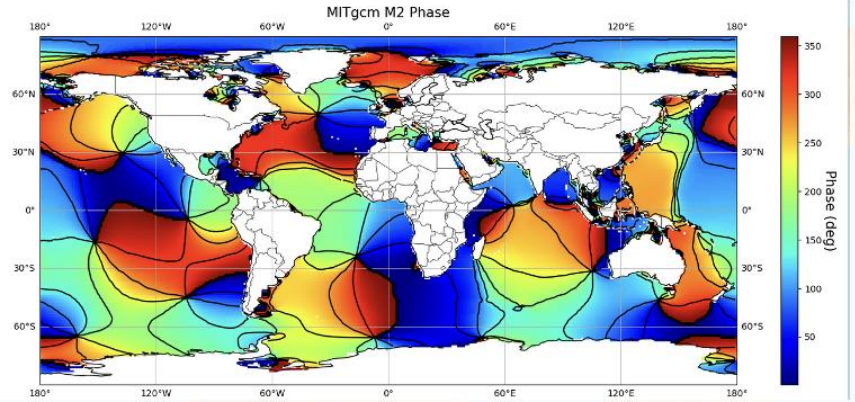
PROGRESS:

Validation of the M2 tidal signal

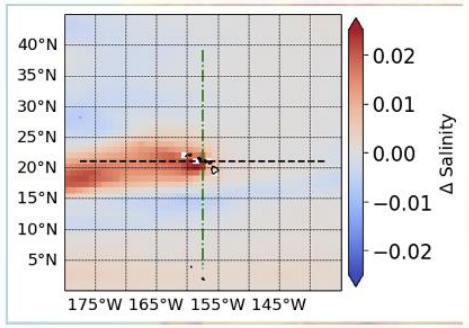
TPXO

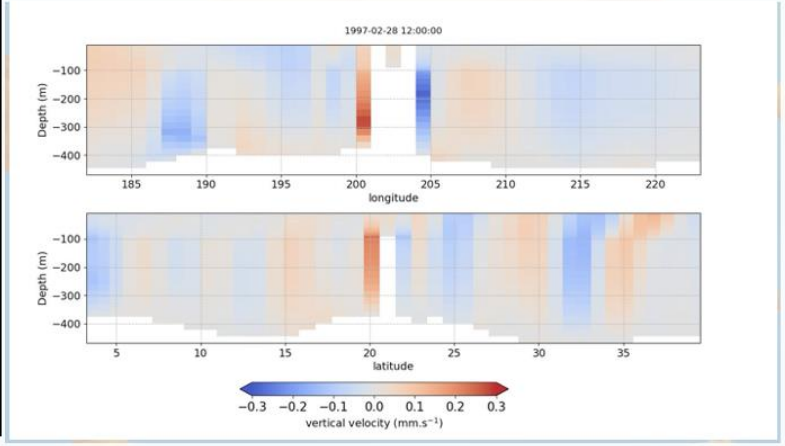


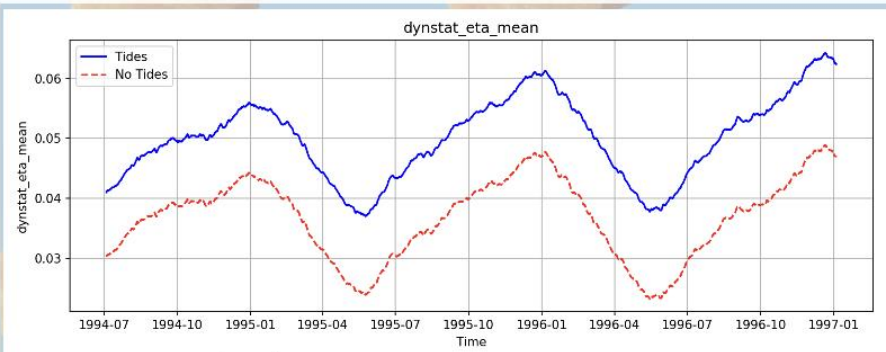
MITgcm

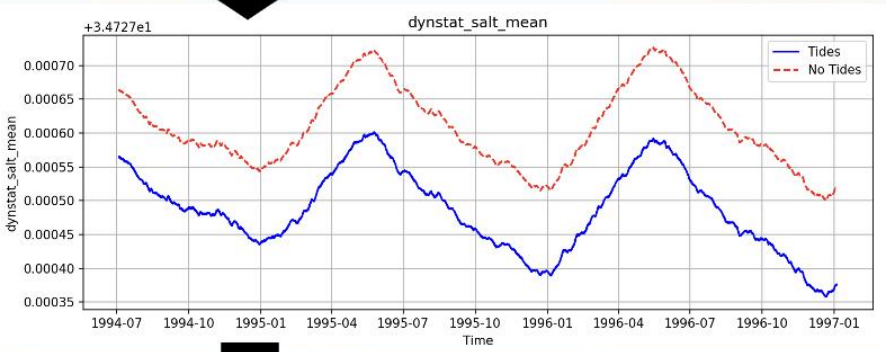


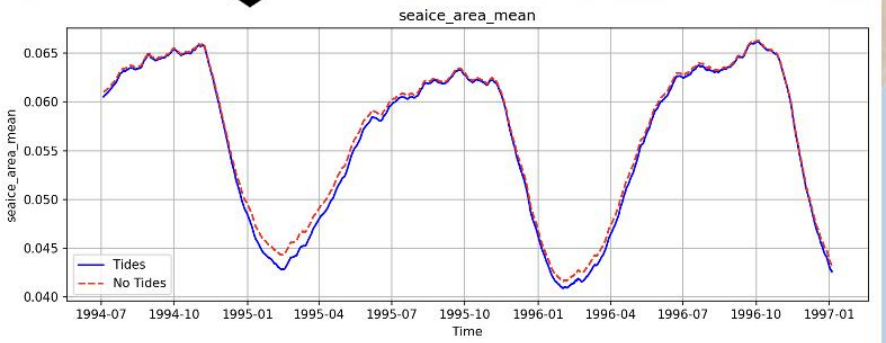
Hawaï transect > no clear internal tides > Need to dig further







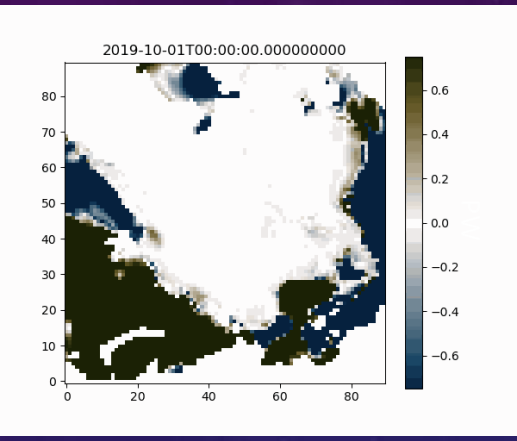




MACKENZIE FRESHWATER LAYERS UNCOVER RIVER-ICE EVOLUTION

McFLURRIE

Marie Zahn, Cara Williams,
Oceanne Bousquet, Mike Wood



Objectives:

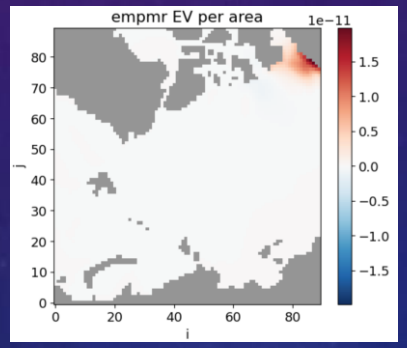
- To investigate how sea ice responds to increased freshwater input near the mouth of the Mackenzie River using perturbation experiments.
- To assess the sensitivity and drivers of surface salinity anomalies near the Mackenzie River.

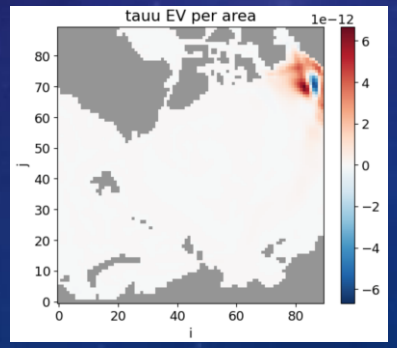
COMPLETED:

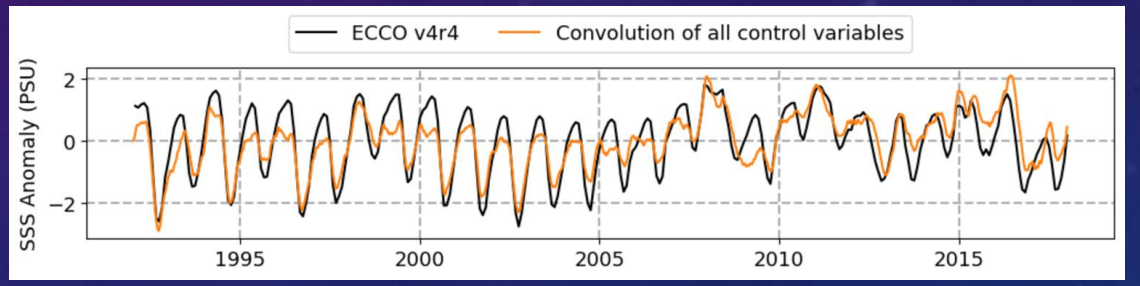
- Configured and ran four ECCOv4r5 runs (daily, 2014-2019):
  1. control run
  2. 1.1x runoff
  3. 1.1x Mackenzie runoff
  4. time-varying runoff
- Analyzed model output
- Ran adjoint and convolution
- Computed OHC and stratification in upper 20 m

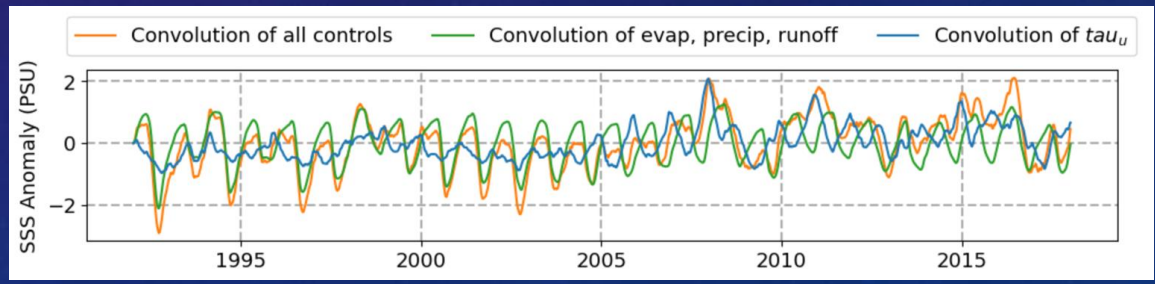
UPCOMING:

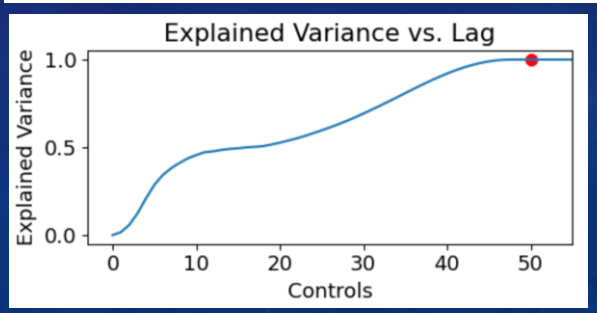
- Continue interpretation of results
- Finalize figures and presentation
- Complete github documentation

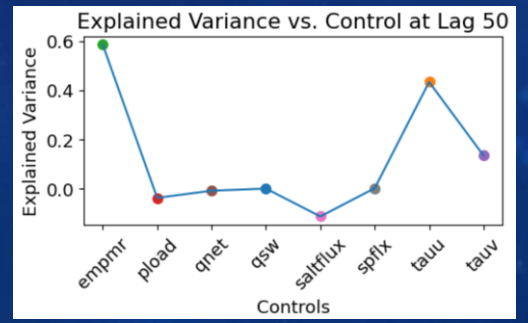










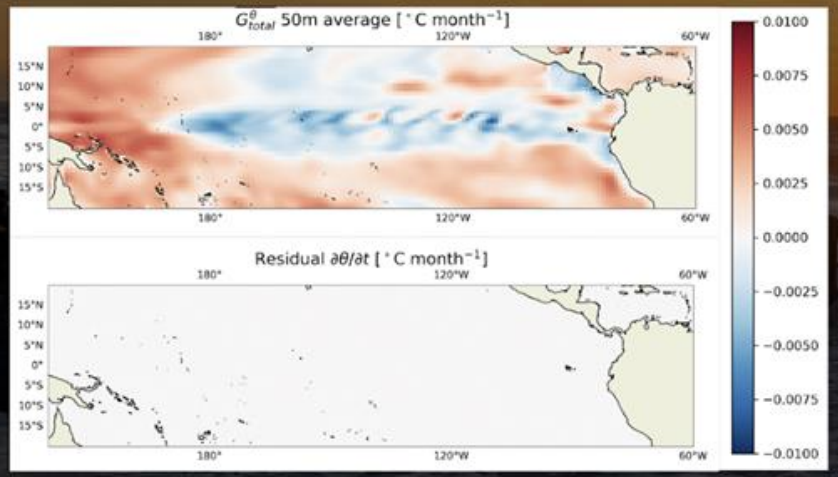


THU 29.05 update

ECCOv4r5-Based Analysis of Cooling Trends in the Upper Tropical Eastern Pacific

Feng Jiang, Andrea Mosso, Antonio Robles, Suman Shekhar, Zhangzhe Zhao

✔ We finalised the heat budget analysis of the Upper Tropical Pacific for the ECCO Central Estimate, which is now closed! and consistent with results from the emu budget tool. 👉



We performed 3 experiments (finally correctly) representing our hypothesised mechanisms for Equatorial Pacific cooling:

- ✔ Zonal ***wind stress*** doubling in the central Equatorial Pacific 🌪️
- ✔ Reduced (halved) ***background vertical*** diffusivity in the top 100 m 🌀
- ✔ Increased ***salinity input*** in the Warm Pool 🧂

Does each of the three actually affect the temperature trend of the Tropical Eastern Pacific?

No spoiler, that is for tomorrow! 🐵

TODAY'S PLAN

1. apply the budget analysis to the 3 experiments
2. extend the physical interpretation!
3. analyse the adjoint sensitivity experiment
4. prepare slides for tomorrow