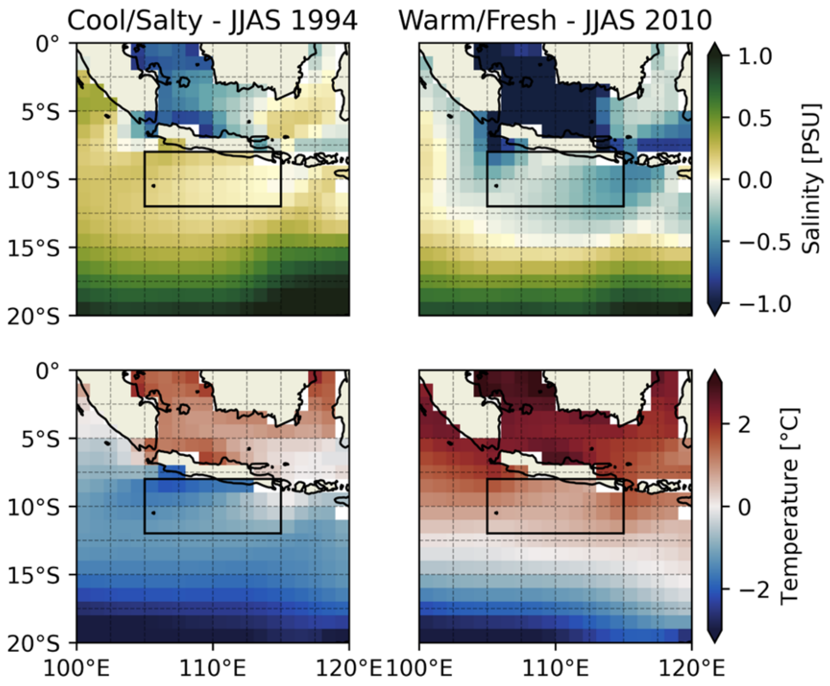

WELCOME
DAY 9

ECCO-UP Team: Andrew, Sree and Mili

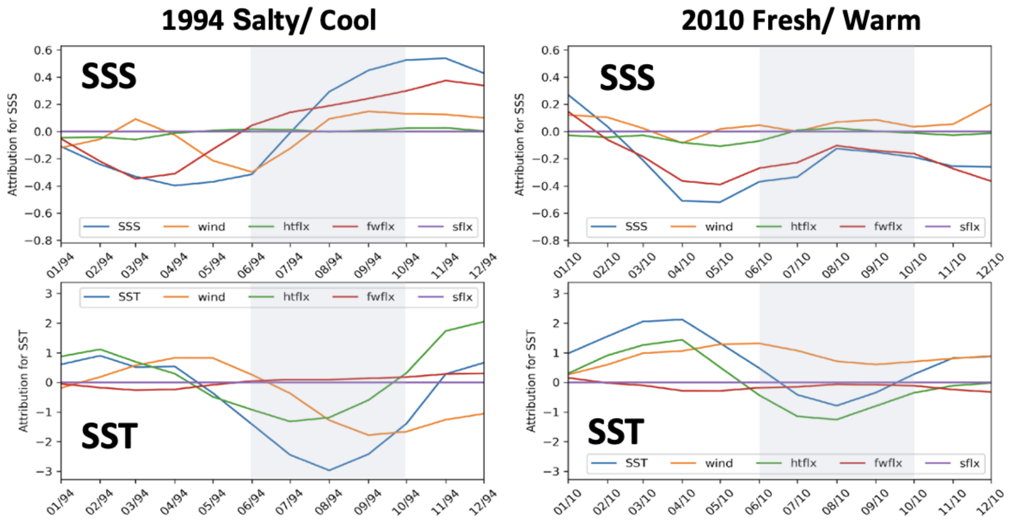
Objective: Understand the drivers of SST and SSS interannual variability in the Java coast upwelling region.



Progress:

- **Plotted and interpreted the output from EMU Attribution and Budget Tools.**
- **Run and plotted Adjoint simulations.**

EMU Attribution for box region



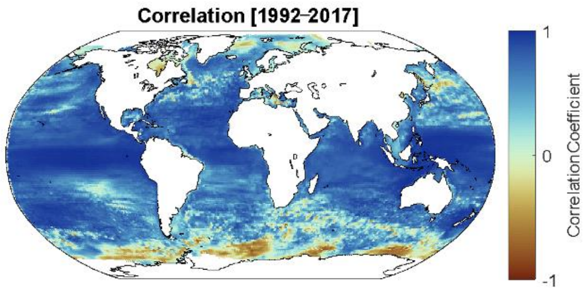
In both the years, SSS and SST changes are sensitive to FW Flux and Heat Flux. Wind forcing seems to have an impact on the SST and SSS changes only during JJAS 1994.

Next step:

- **Interpret the results from adjoint simulations.**

st**ER**ic **IN**vestigations **(ERIN)**: how well does ECCO capture the steric se level signal?

AIM: To compare the steric sea-level component from the ECCO model to that from the most recent global mean sea-level (GMSL) reconstruction [Dangendorf et al., 2024]

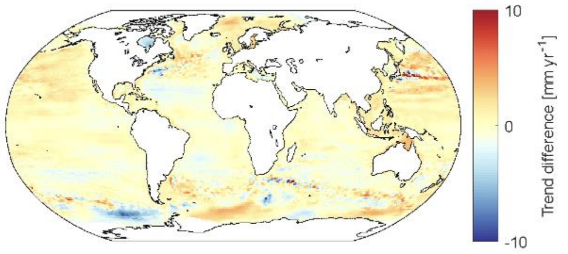


Temporal correlation

Trend differences

YDAY's PROGRESS:

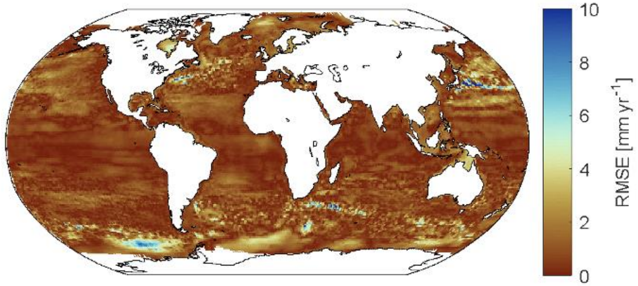
- Temporal + spatial correlation
- RMSE
- Just looked at the trend differences between each of them



RMSE

PLAN:

- Look at areas where the correlation is worse? – boundary currents/coasts/specific basins

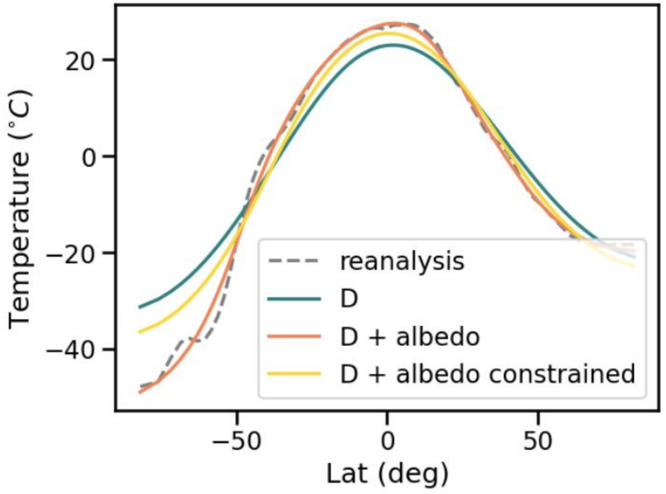


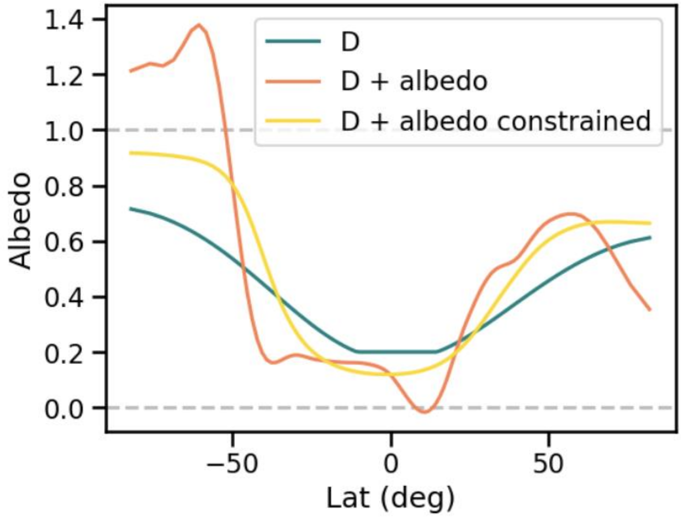
Karina Ramos Musalem, Noah Rosenberg

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

Tuesday 5-27 Status

- Added constraints to controls to target more realistic fits
- Began to implement L-BFGS (Noah)
- Began to implement time dependence in order to target solar cycles (Karina)



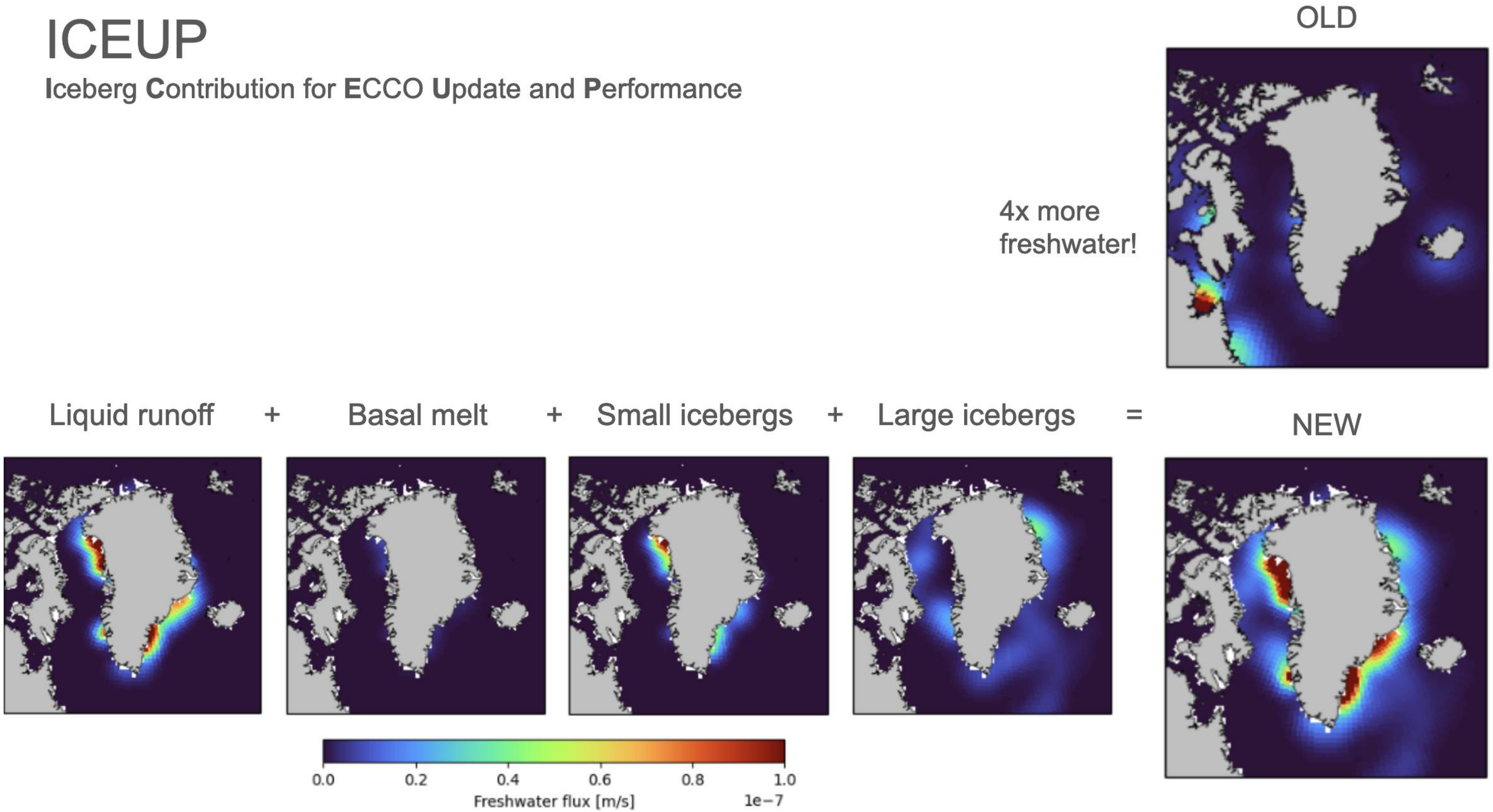


Next Steps:

- Keep going with above
- See if there's an easy way to move everything to Jupyter notebooks to make further development way easier

ICEUP

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

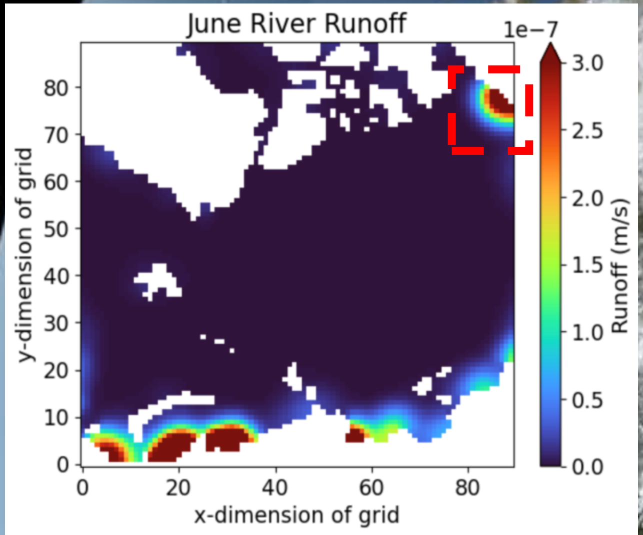


Mackenzie Freshwater Layers Uncover River Runoff-Ice Evolution (McFLURRIE)

Marie Zahn, Cara Williams, Oceanne Bousquet, Mike Wood

Objective: To investigate the response of sea ice to increased freshwater input through a perturbation study

Upcoming:
- Check-out the adjoint sensitivity analysis
- Interpret results from model runs
- Compare them to LLC1080 results

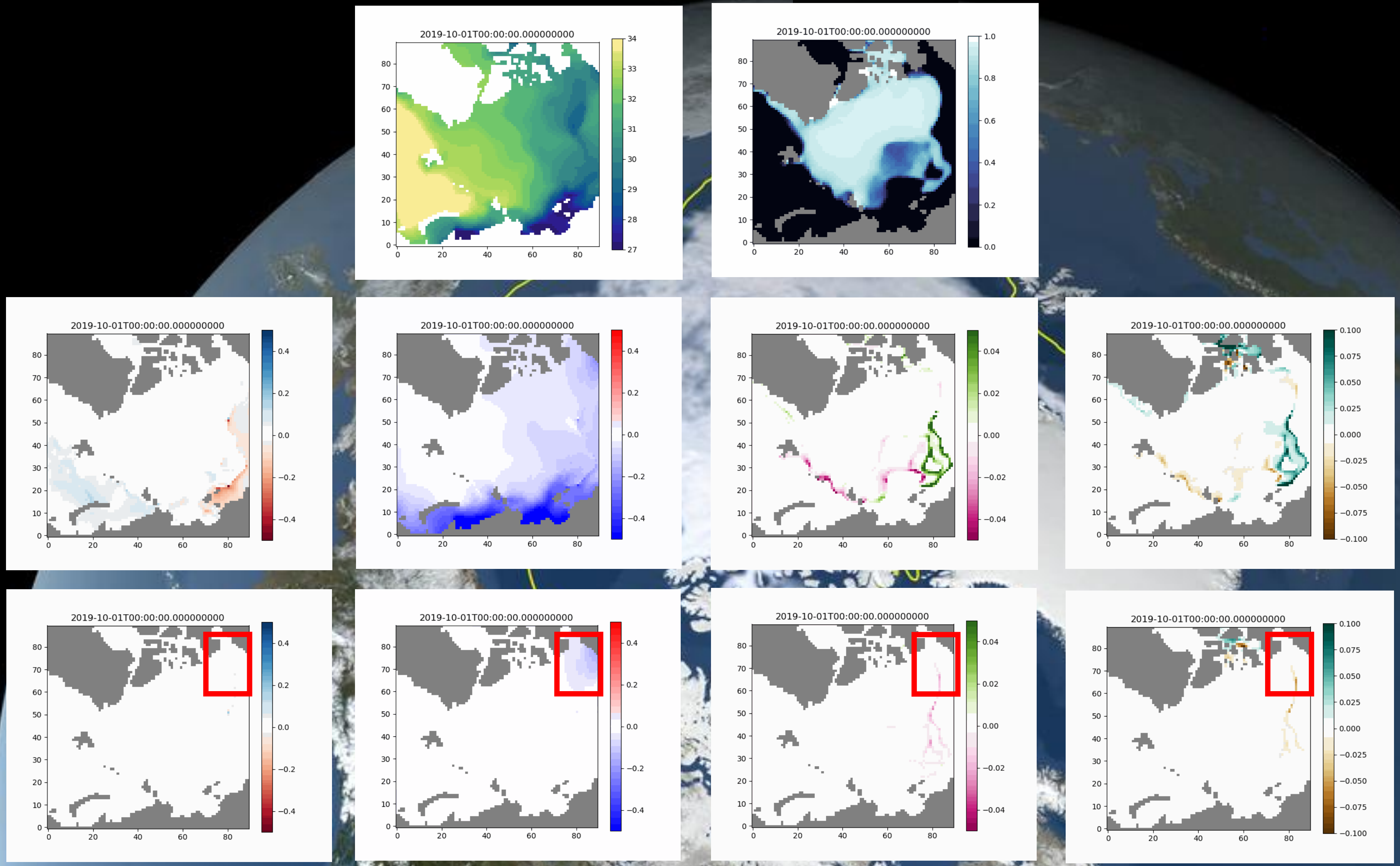


Study region

Completed:
- Configured and ran four ECCOv4r5 runs:
  1. control run, daily, 2014-2019
  2. 1.1x total runoff, daily, 2014-2019
  3. 1.1x Mackenzie runoff, daily, 2014-2019
  4. time-varying runoff, daily, 2014-2019
- Created a mask for adjoint sensitivity analysis
- Ran the adjoint sensitivity analysis
- Compared impact of increase runoff:
  1. 1,1x runoff minus control, OND, 2014-2019
  2. 1,1x Mackenzie runoff minus control, OND, 2014-2019
  3. Time-varying runoff minus control, OND, 2014-2019

SST | SALT | SIarea | SIheff

2019



Control

1.1x total runoff - control

1.1x Mackenzie runoff - control

Physical Processes Impacting Regional Sea Level (PISeaL)

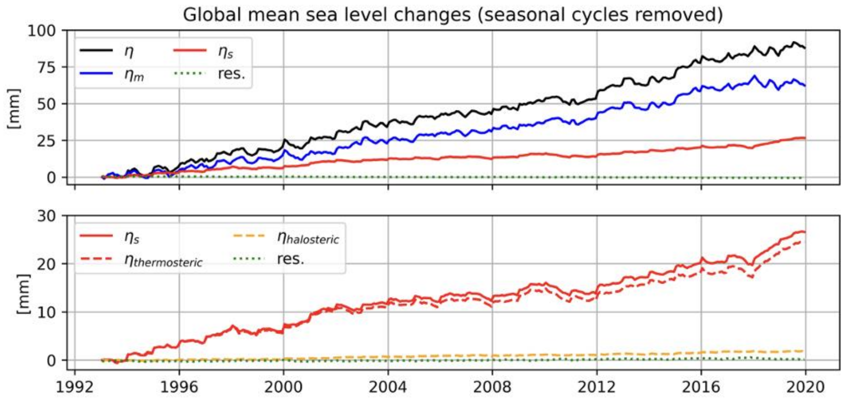
Yueyang Lu, Odilon Houndegnonto

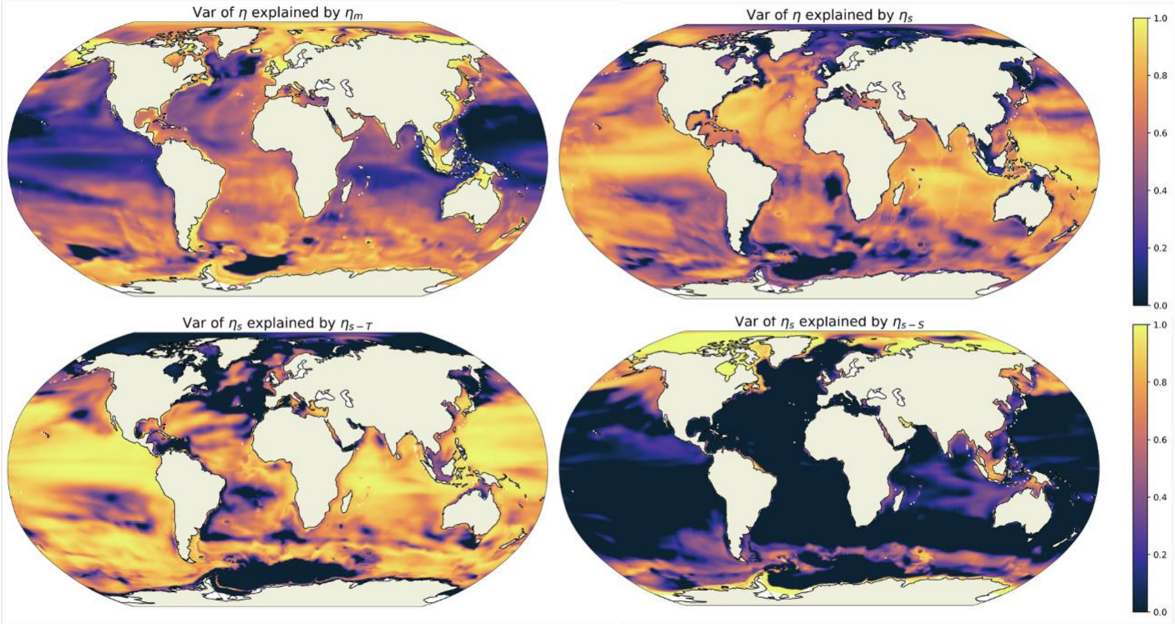
- Sea level partition: manometric and steric (thermosteric + halosteric) components:

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

$$\eta_{s-T} = -\frac{1}{\rho_0}\int_{-H}^{0} [\rho(S_r, T, p) - \rho(S_r, T_r, p)]\, dz^*$$

$$\eta_{s-S} = -\frac{1}{\rho_0}\int_{-H}^{0} [\rho(S, T_r, p) - \rho(S_r, T_r, p)]\, dz^*$$





Next steps:

- See if η_m can be linked to volume/mass flux convergence
- Perform regional analysis on the processes affecting sea level (e.g., around Weddell Sea, η is not explained by neither η_m nor η_s)

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

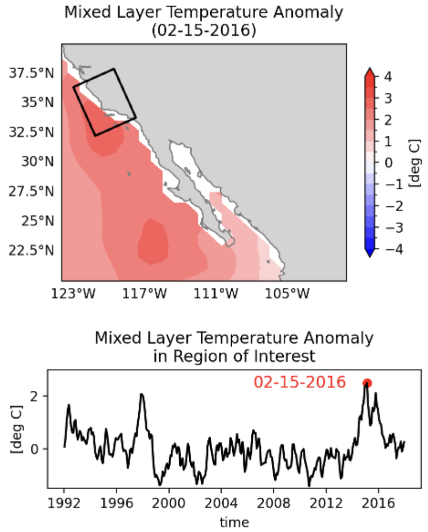
PROJECT UPDATES; MAY 27

SUMMARY; MAY 26 –

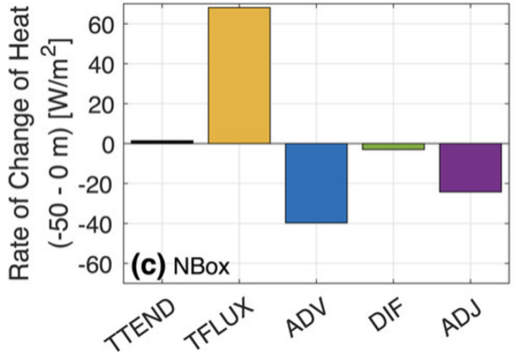
- Began heat budget analysis–visual comparison to Zaba et al. results promising!
- Obtained preliminary adjoint gradients for SST anomalies over model domain (2+ subsequent runs, in progress)
- Made progress towards organizing GitHub page

THE PLAN; MAY 27 –

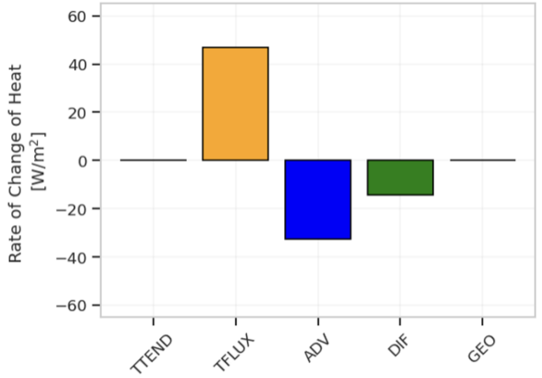
- Analyze adjoint sensitivity run results (surface & subsurface)
- Compare & analyze budget results
- Organize GitHub page: describe research question & approach, document progress



ZABA ET AL. MEAN HEAT BUDGET



OUR ANALYSIS



Caeli Griffin, Anthony Meza, & Yue Wu

SO-WARM: Southern Ocean – extreme Warm event Analysis of dynamical forRcing and iMpacts

Methods:

1 Step: Identify the extreme event (Make sure ECCO catches it)

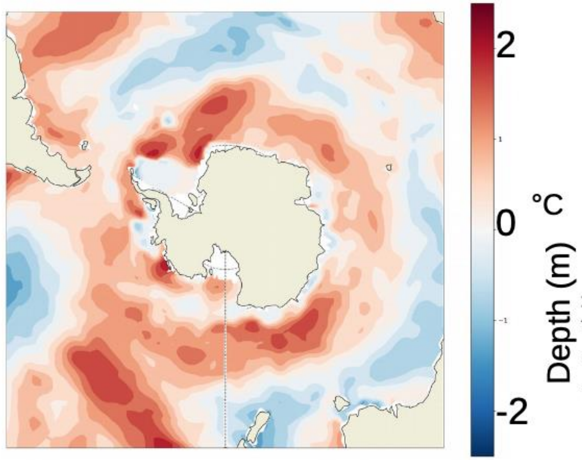
Objectives:

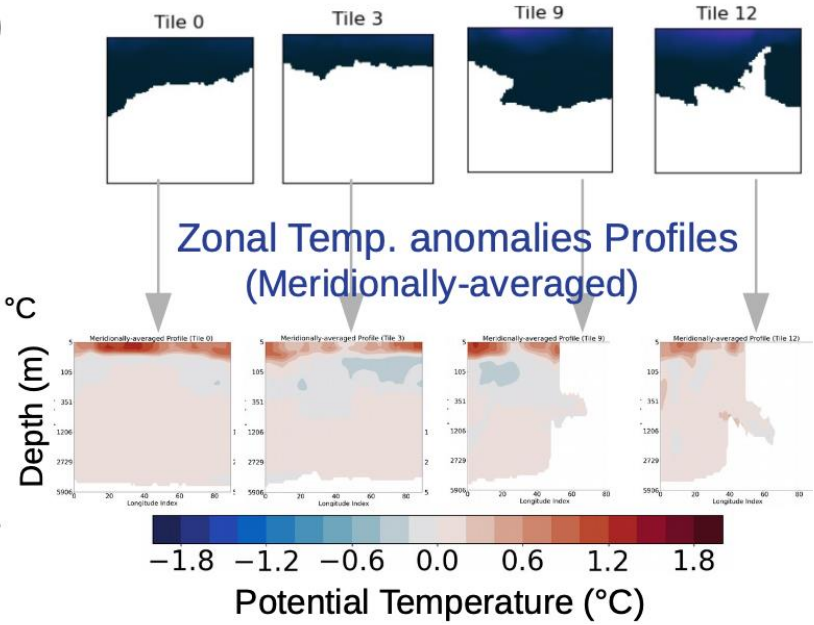
1: Dynamics of strong summer 2017 Marine Heatwave (MHW) in SO (Dec 2016 – Feb 2017)

2: How does this MHW affect circulation patterns/ transport around the SO?

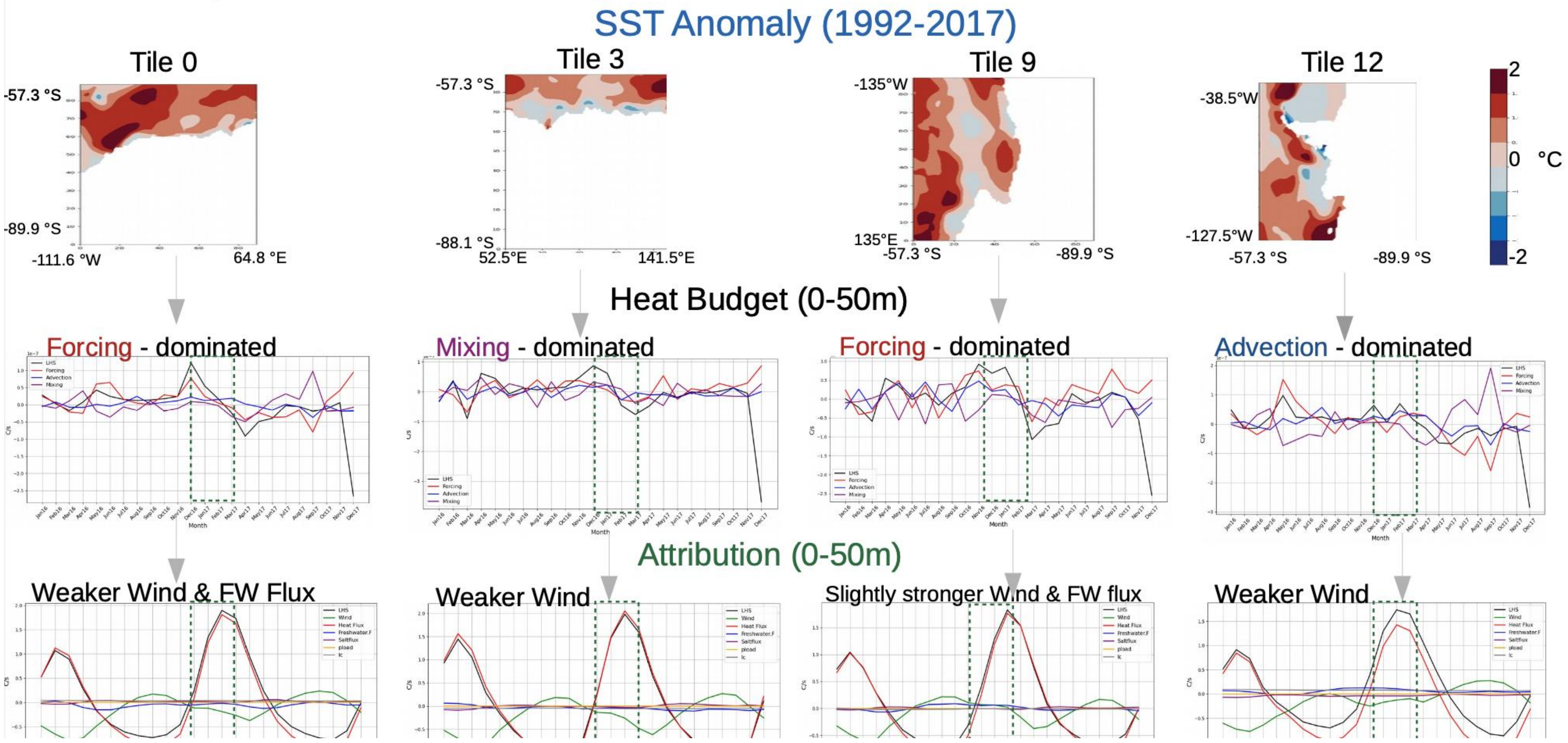
Data: ECCO V4/r4 monthly temperature

SST Anomaly (Feb 2017)





2 Step : EMU Heat Budget & Attribution Tool: Anomalous Timeseries

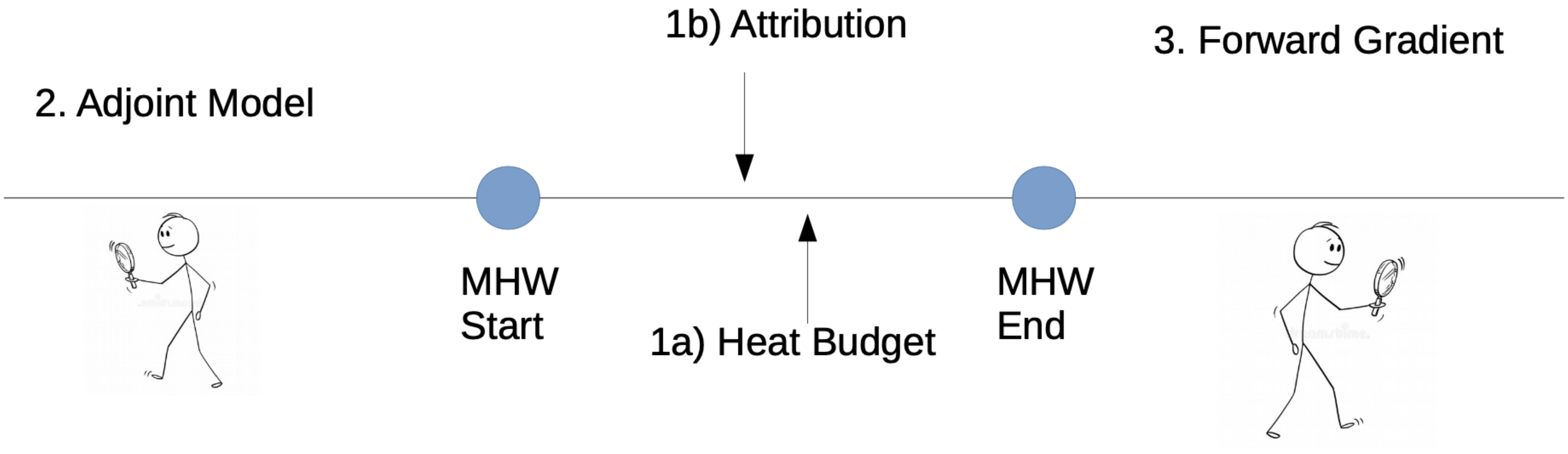


3 Step : Adjoint Model & Forward Gradient

Given these conclusions *do not* apply to the 0-300m Heat Budget & Attribution:

Next 3 days:

1) Adjoint model: **Identify** sensitivities to variables (wind stress, atmosphere heat fluxes, etc).
2) Forward Gradient: **Perturbation** impact on circulation/transport



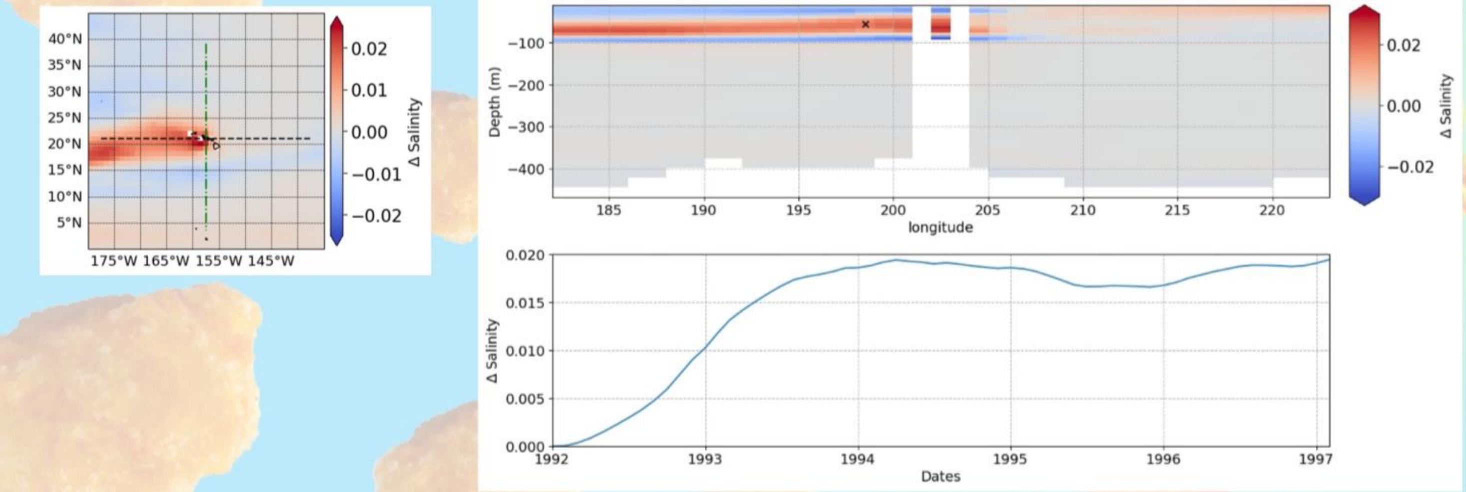
TURN ON THE TIDES (ToTs)

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

- **PROJECT:** Activate and implement tides in ECCOv4r5

Progress:

- Analysis of tracers (salinity and temperature) differences between tide and notide runs
- Analysis of sea surface anomaly using uTIDE package
- Start of analysis of TPXO output to compare with our tide output



- Fix some problems with TPXO