
WELCOME
Day 5

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

Marie Zahn, Cara Williams, Oceanne Bousquet, Mike Wood

Yesterday:

Configured and ran three new ECCO runs:

(1) v4r5, control run, daily, 2014-2020

(2) v4r5, 1.1x runoff, daily, 2014-2020

(3) v4r5, time-varying runoff, daily, 2014-2020

- Created a mask for adjoint sensitivity analysis

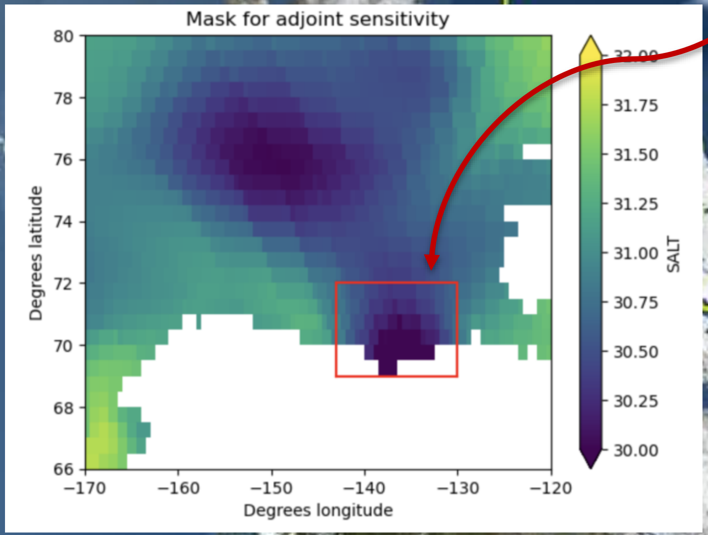
Today:

Check out results of model runs!

Compare them to LLC1080 results

Consider changing runoff modification to only include the Mackenzie river / the Arctic rivers

(Time-dependent) Run the adjoint sensitivity analysis



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

PROJECT UPDATES; MAY 23

OBJECTIVES; LONG-TERM –

1) **Close the volume & heat budgets for Zaba et al. model region & period**, using the ECCO Central Estimate
2) Perform a sensitivity analysis to identify drivers of variability in the heat & volume budgets–**do our results agree with Zaba et al. findings?**
3) Literature identifies coastally-trapped waves as mechanism for persistent thermosteric anomaly along California coast–**does this anomaly appear in the Central Estimate?**
4) Rinse & repeat steps (1) & (2) for South China Sea–**how are volume & heat budgets affected by model region?**

SUMMARY; MAY 22 –

- Read/discussed Zaba et al. 2019
- Surface (0-50 m) & subsurface (100-210 m) masks for model domain completed
- Difficulty loading V4R4 snapshots → currently troubleshooting!
- Encountered issues running EMU budget tool for arbitrary control volume → will try to follow ecco_v4_py tutorials

THE PLAN; MAY 23 –

- Read/discussed Verdy et al. 2013
- Proceed with volume & heat budget calculations
- Organize GitHub page: describe research question & approach, document progress

Caeli Griffin, Anthony Meza, & Yue Wu

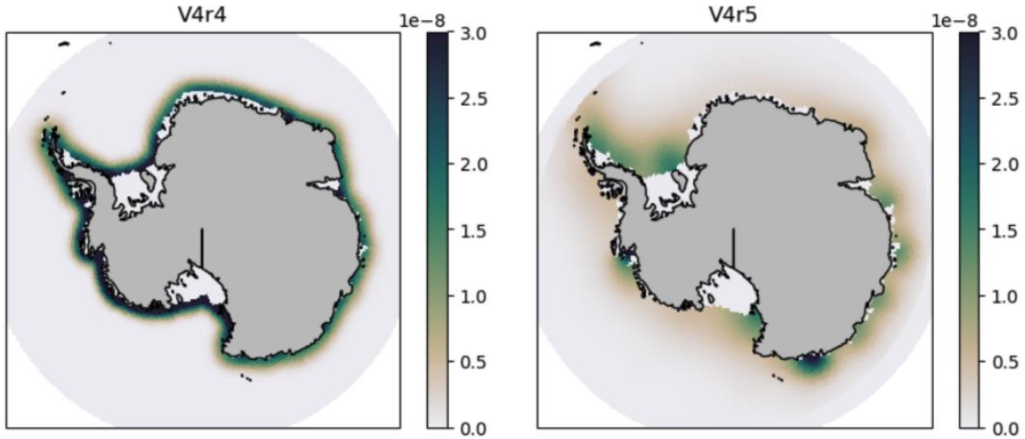
ICEUP

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

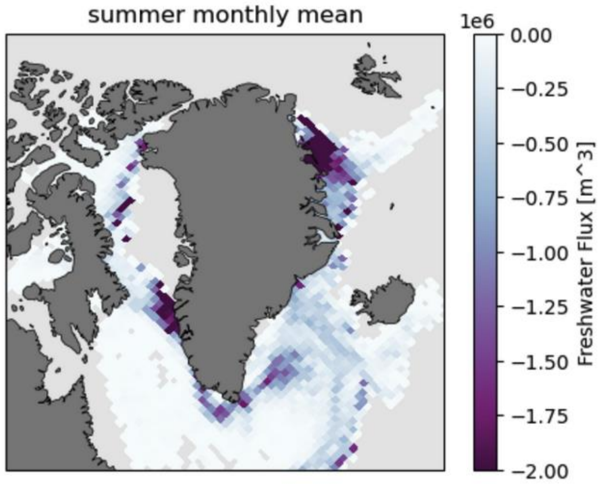
Goal:

Update the freshwater forcings of ECCO v4 from Greenland Ice Sheet (include icebergs)

Run V4r4 with new freshwater forcings using EMU



ALTIBERG dataset of freshwater flux from icebergs



GEUS provides expected **solid** and **liquid** freshwater fluxes

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SOLID ICE DISCHARGE IN m^3

winter mean monthly average (oct-mar):
Expected (GEUS): 1360000000.0
ALTIBERG:          337224740.0

summer mean monthly average (apr-sep):
Expected (GEUS): 1380000000.0
ALTIBERG:          834612200.0
```

Yesterday, I did some calculations

In the summer, ALTIBERG sees 61% of the total solid discharge

Remaining solid flux and liquid flux will be divided along coast

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

AIM:

Compare the steric sea-level contribution from the ECCO model to that from the most recent global mean sea-level (GMSL) reconstruction by Dangendorf et al. (2024)

POA: (LONG TERM)

- Calculate steric sea-level signal from ECCO
- Create some figures to get used to the data
- Extract steric component from Dangendorf et al. (2024) GMSL reconstruction
- Statistical comparison of steric components from both (use correlation, RMSE etc)
- Investigate spatial/temporal mismatches between the two datasets
  - Deep dive into specific regions?
  - Steric sea-level at the coast?
    - Evaluate potential causes of divergence

TOOLS:

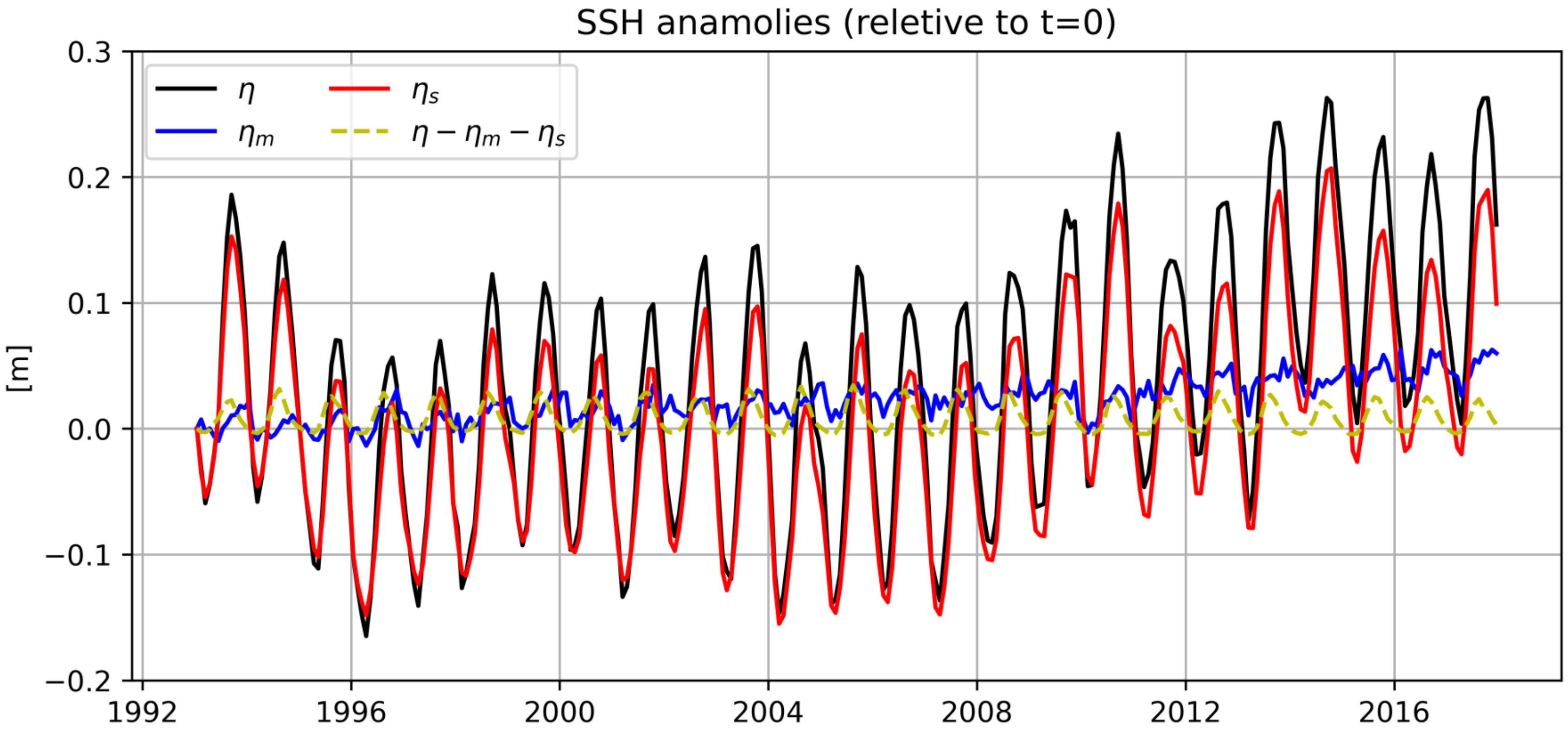
- ECCO v4r4
- Dangendorf et al. (2024) GMSL reconstruction

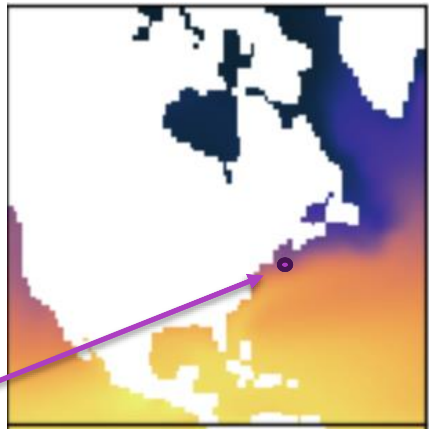
SHORT TERM:

- Calculate steric sea-level signal from ECCO v4r4 data
- Plot both ECCO steric signal and the signal from the reconstruction

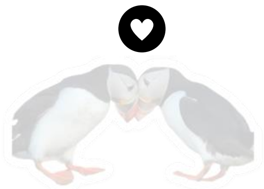
- Sea level partition: manometric (mass) and steric (density) components:

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





<u>PUFFIN</u>: Dee**P** Western Bo**U**ndary Current **F**lux and **F**orcing Mechan**I**sms i**N** ECCO



Lilli Enders

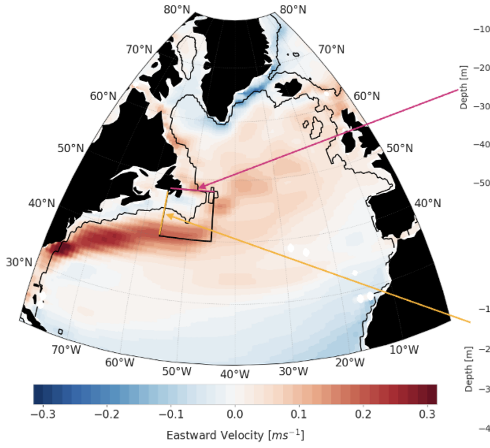
Science Questions:
In this project, I'd like to focus on the factors that influence the bifurcation of the DWBC at TGB using ECCO by asking,

1. Does variability in DWBC transport in the LS make it out of the LS and onto the North American continental shelf?
2. What mechanisms impact the bifurcation of the DWBC at the TGB (i.e., local/remote WSC, GS position, GS EKE)?

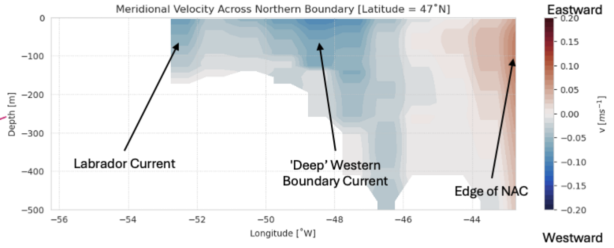
✅ Plotted some output fields to find my currents

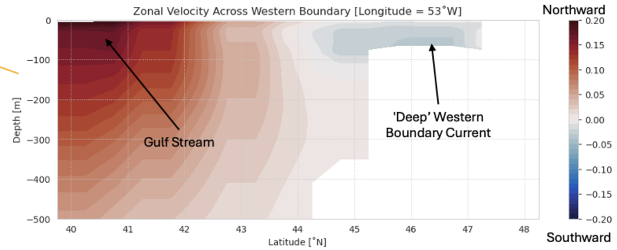
✅ Chose my control volume

Velocities

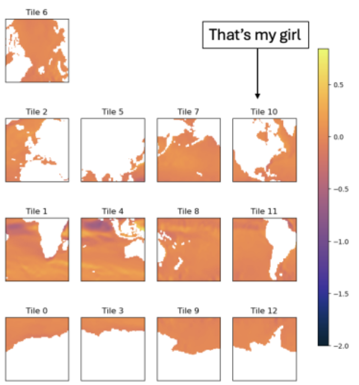


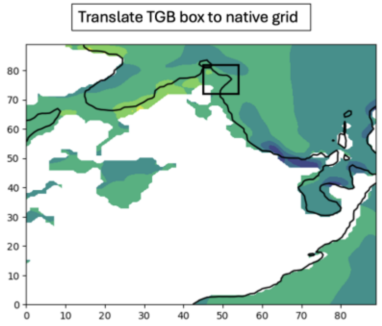
Time means 1992-2019



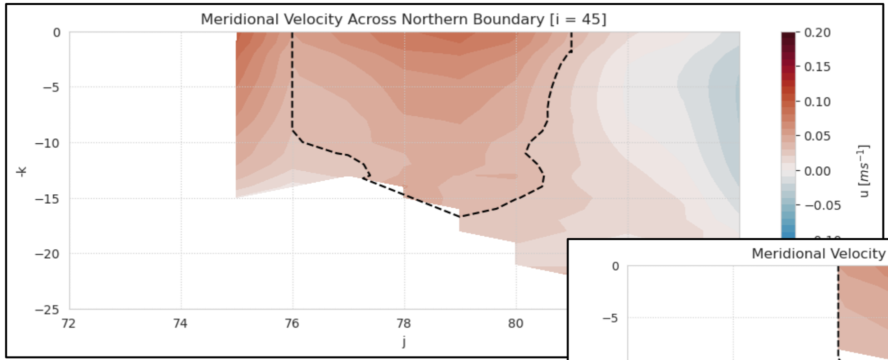


✅ Learned that the North Atlantic is all on one tile

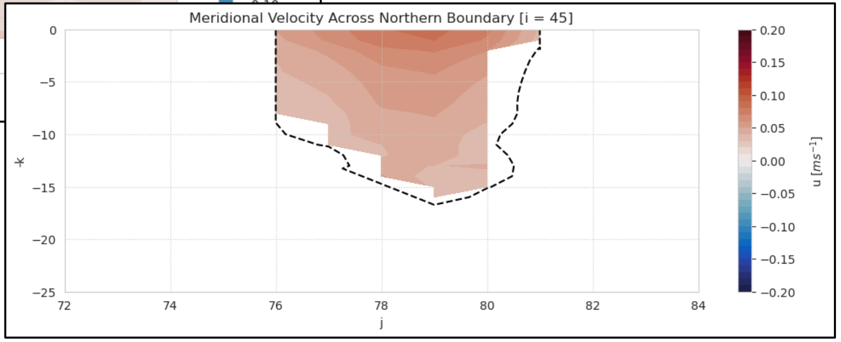




✅ Also learned that the tile is rotated which was hard for me to wrap my mind around



✅ Braved the native grid to make a mask of climatological DWBC position across the North face of the control volume



Today:

- ❑ Finish Flux calculation across Northern face of control volume
- ❑ Repeat for Western face of control volume
- ❑ Run adjoint with Flux across Western face

May 23

TURN ON THE TIDES (ToTs)

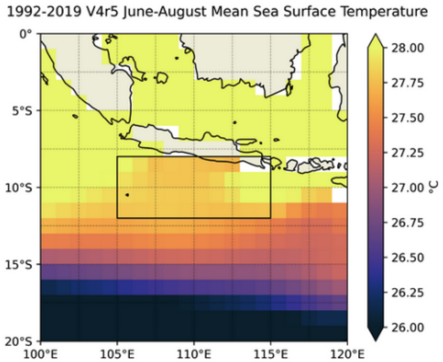
Hinne Van Der Zant, Hugo Plombat, Rebecca Zaja, Yumi Abe, Clément Bertin

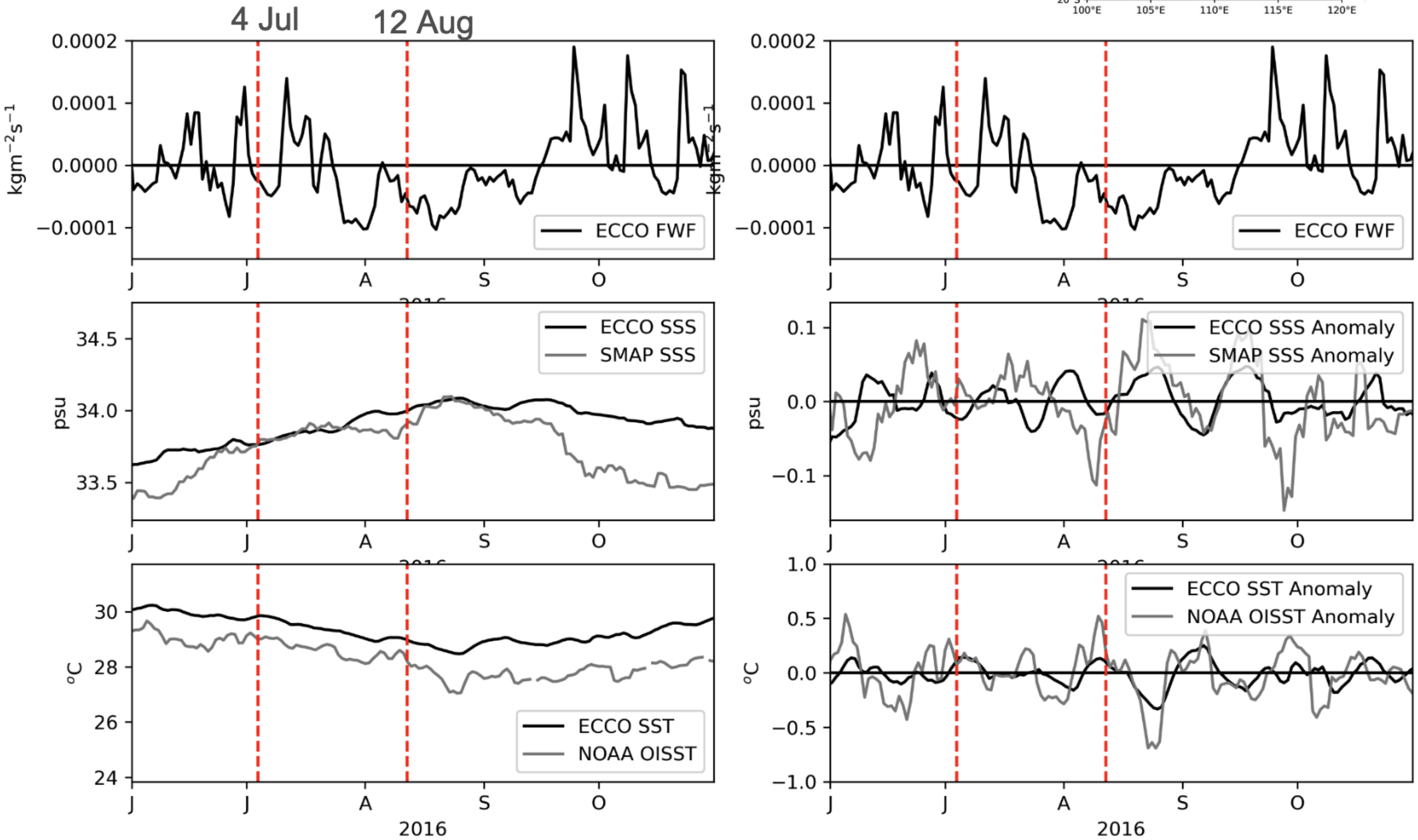
- We imported the SPICE library required to **T**urn **o**n the **T**ide**s**, almost there!
- Now ***waiting for pcluster***, to allow us to debug, and hopefully run the model…

In the mean time…

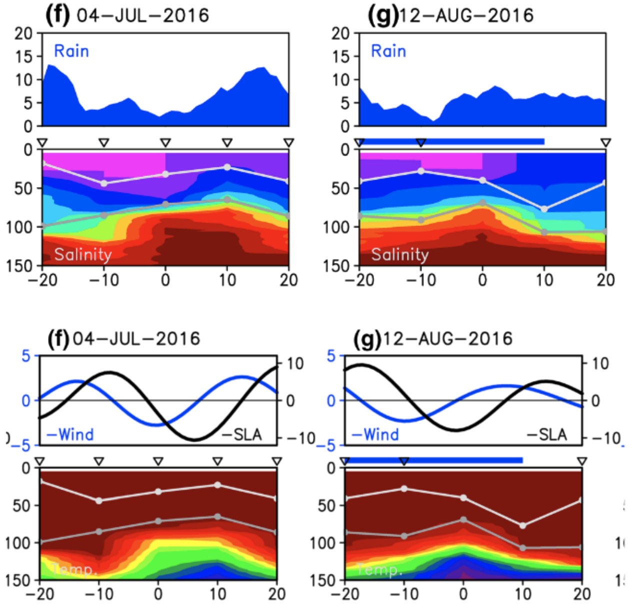
- Getting familiar with MITgcm output, to prepare for the glory day when we'll **T**urn **o**n the **T**ide**s!**
- Running the model on NASA-Pleiades thanks to night shift

ECCO-UP Day 2



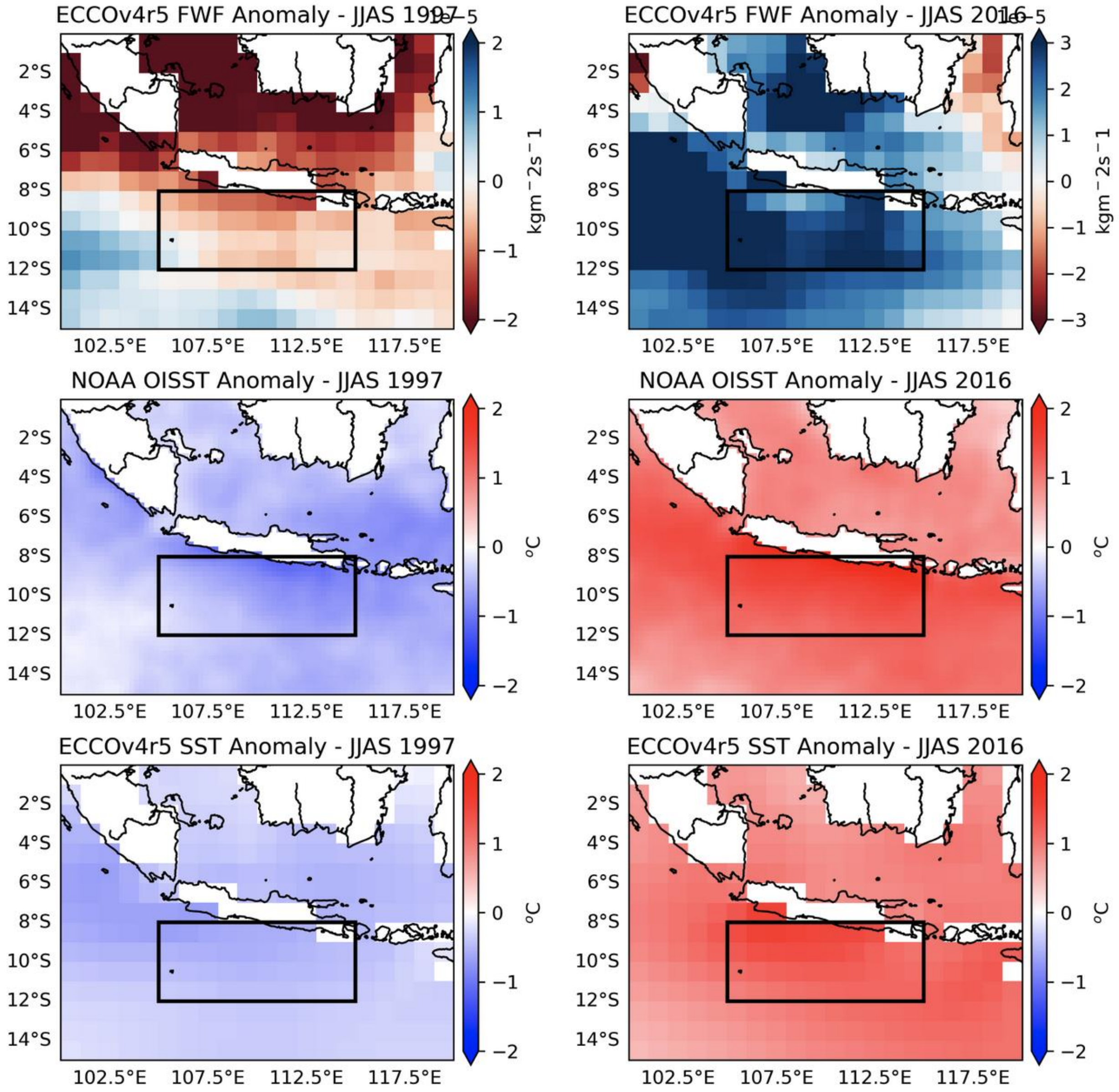


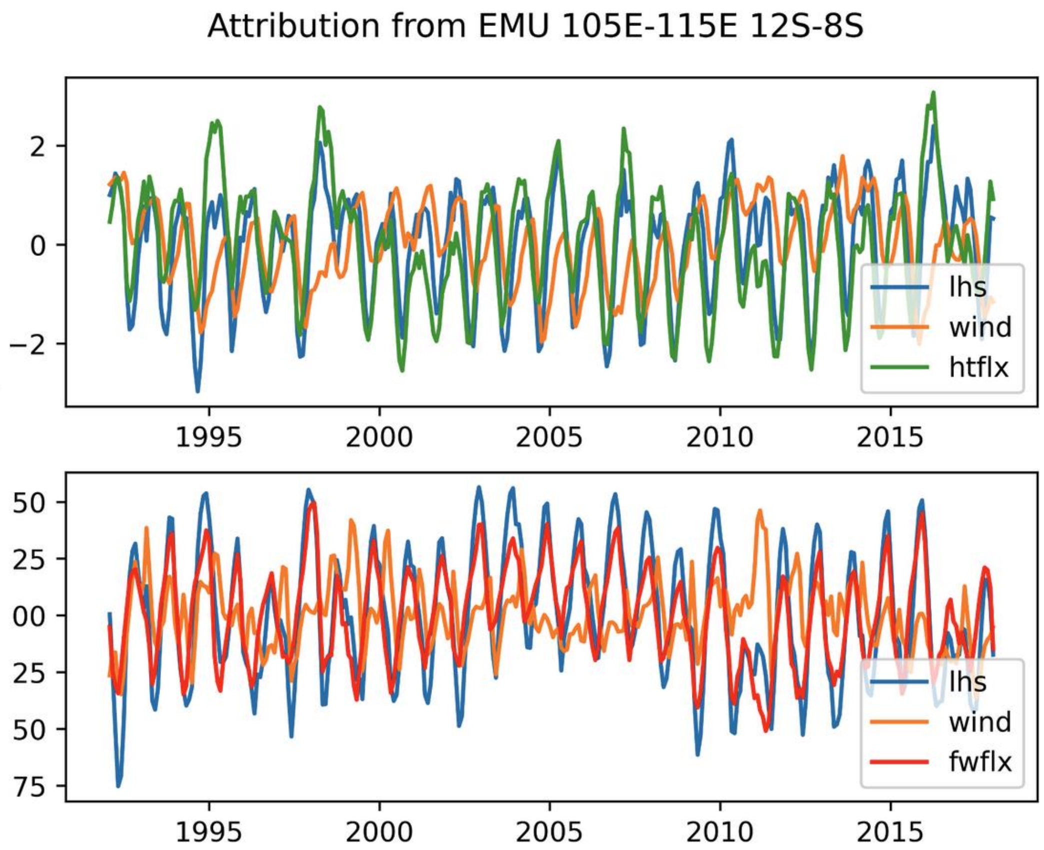
From Argo



Horii et al. 2020

ECCO-UP Day 2





Work for Day 3:

- How to interpret attribution results? Anything interesting there?
- Think about how adjoint sensitivity results could be used here.