Downscaled Regional Modeling from ECCO Solutions

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+ Collaborators I will mention

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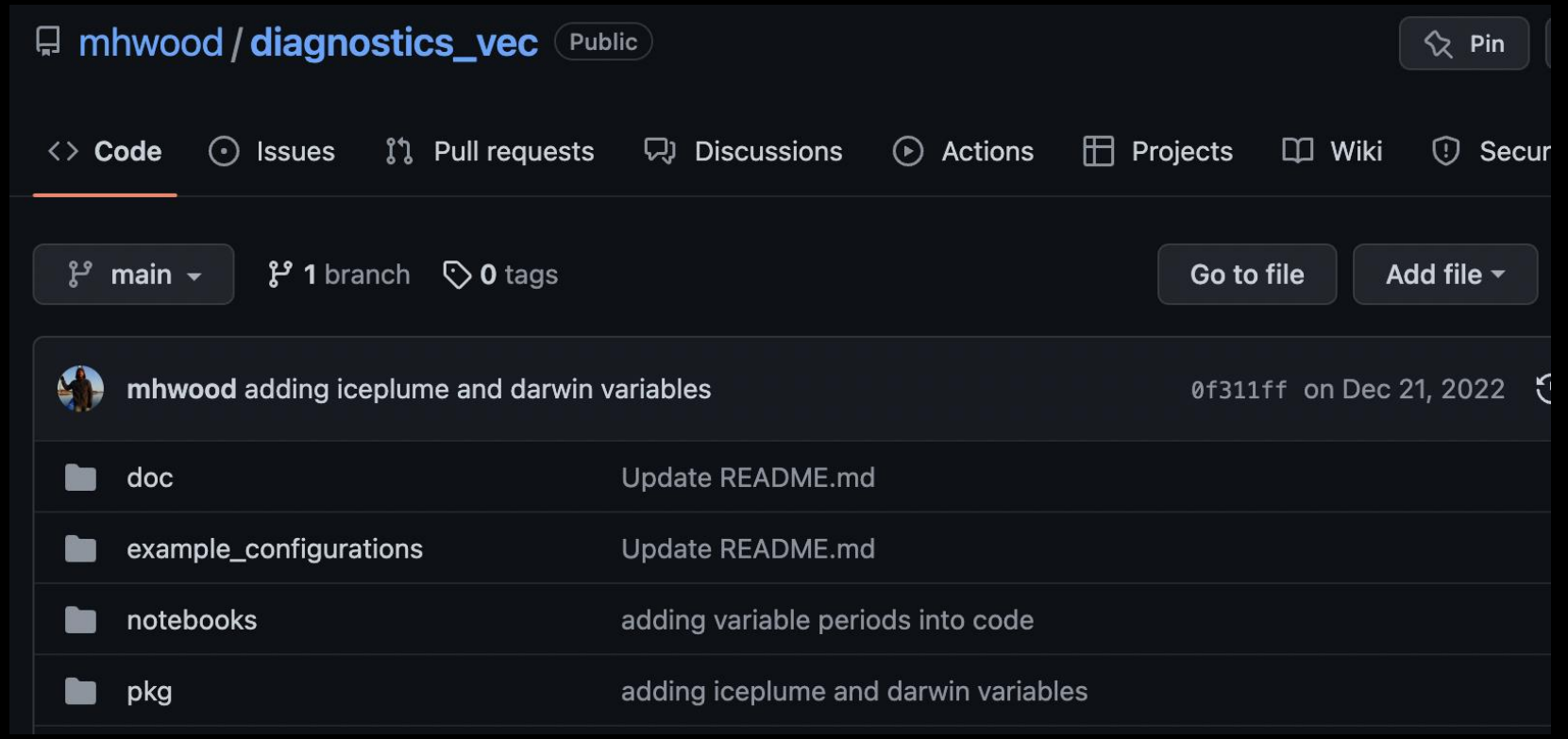
Overview

- Question: How can we use ECCO solutions to force regional models?
- Problem: Global output is big – expensive to output at high frequency
- Solution: Make a new diagnostics pkg which provides output only where you need it
- A few case studies:
  - California Current (SWOT)
  - Arctic Ocean (SASSIE)
  - Greenland Fjords
  - Darwin

diagnostics_vec

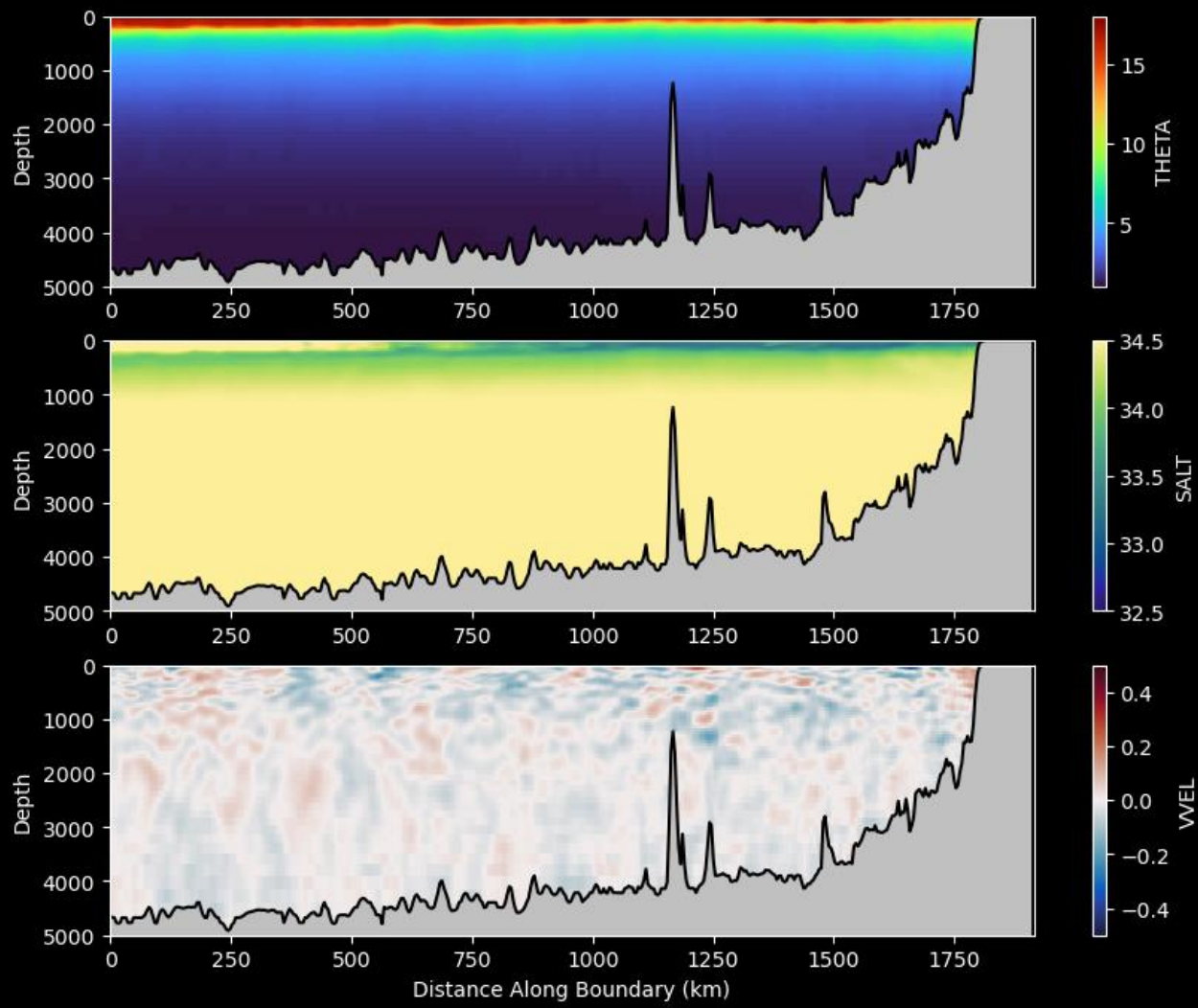
- New package for MITgcm (PR not yet submitted)
- Available at github.com/mhwood/diagnostics_vec



diagnostics_vec

Idea: Provide an ordered mask indicating where you would like the output

Boundary conditions for regional model



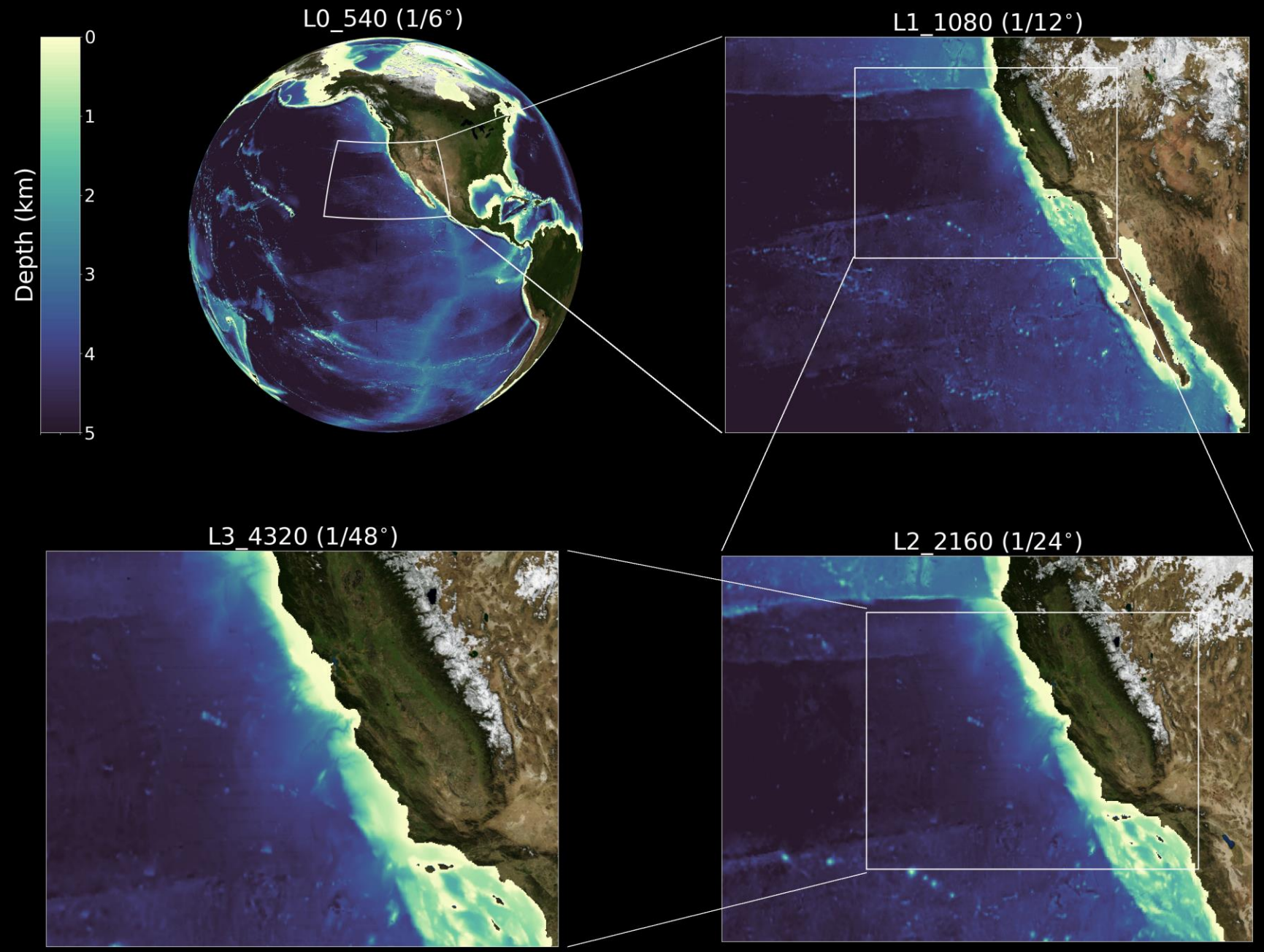
Case Study: California Current

- Supporting SWOT Cal/Val
- Parent Model:

  LLC540 w/ tides
- Resolutions:

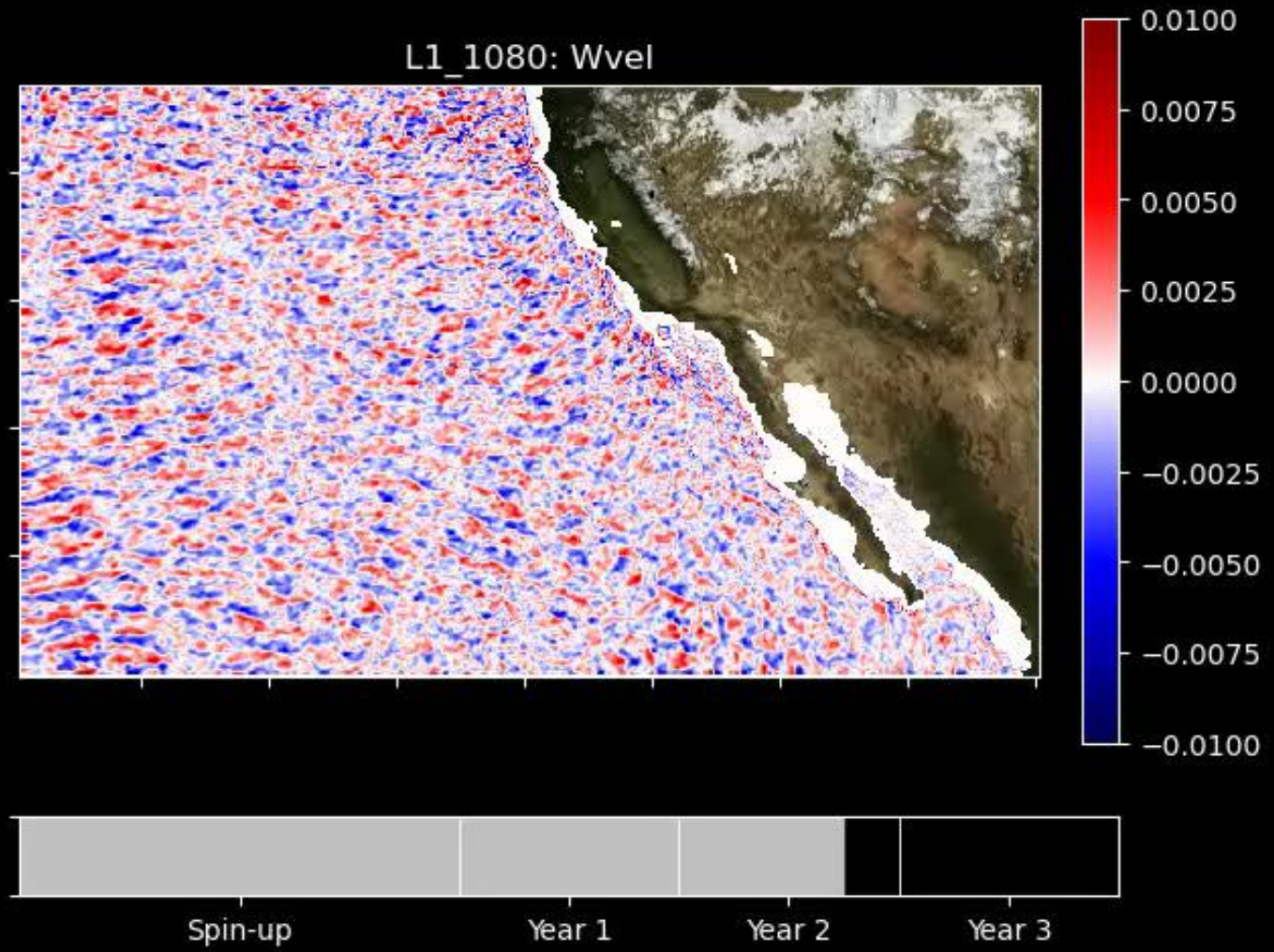
  540, 1080, 2160, 4320
- Time Duration:

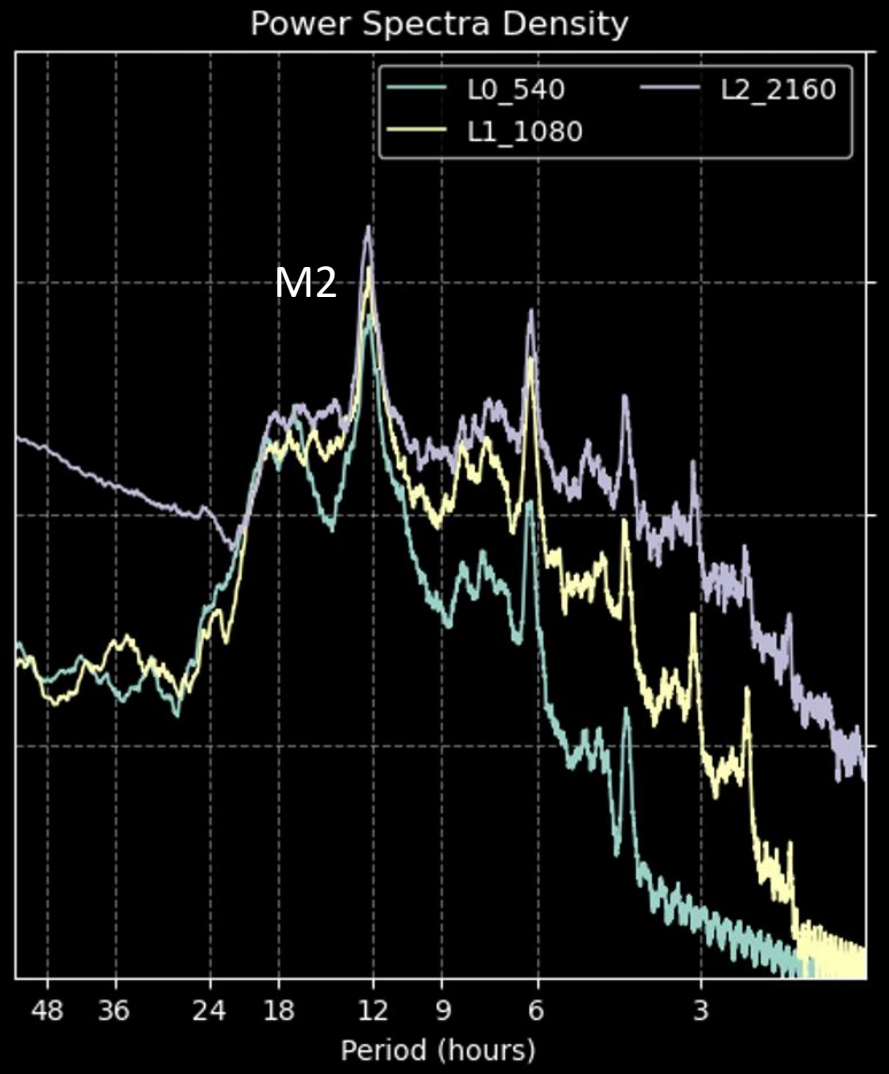
  5 Years (1992-1996)



Developed with Ian Fenty and Jinbo Wang (JPL) w/ help from Carine van der Boog (JPL)

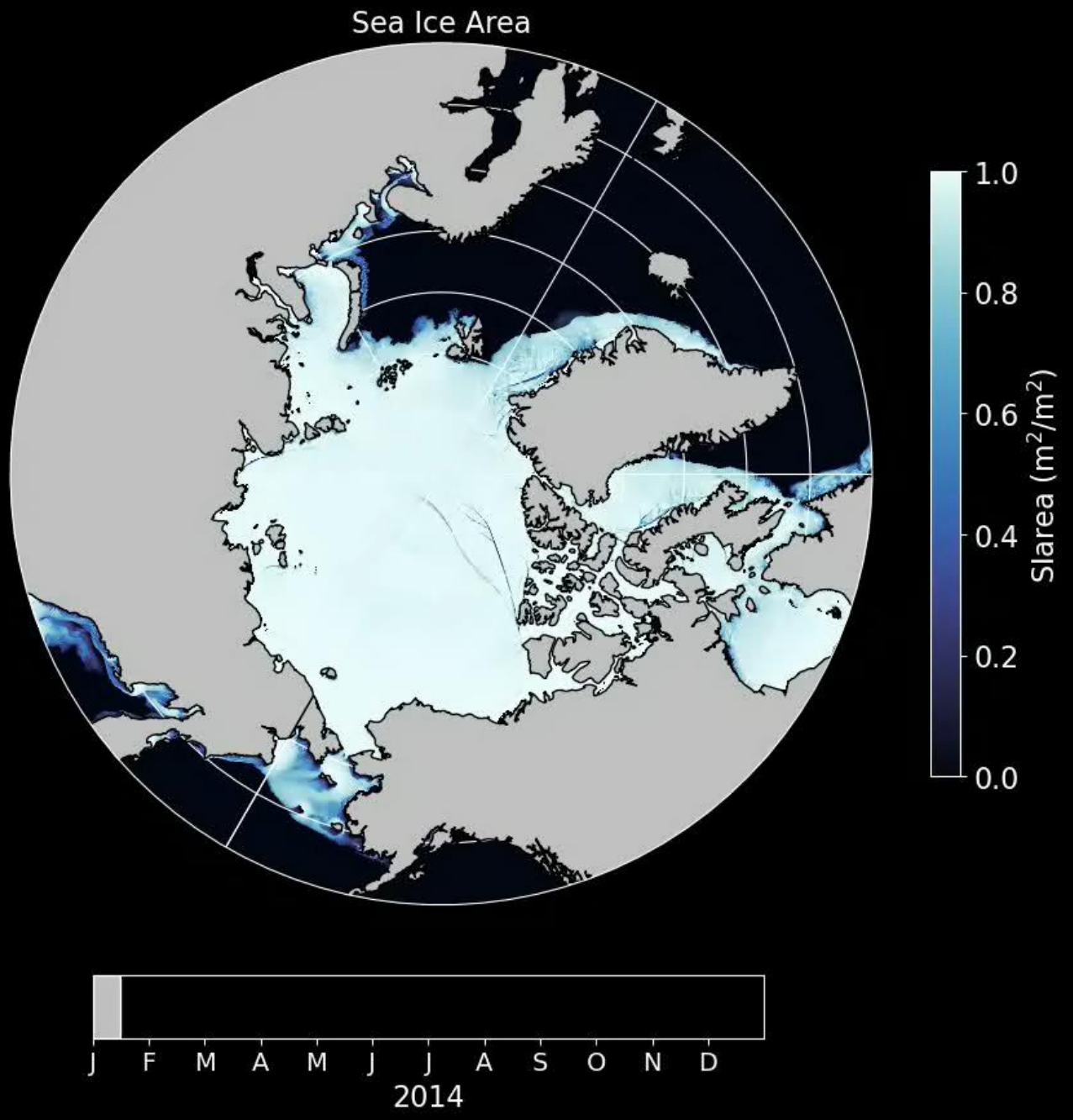
Internal Gravity Waves





Case Study: Arctic Ocean

- Supporting SASSIE
- Parent Model:
  LLC270
- Resolutions:
  270, 1080, 4320
- Time Duration:
  8 Years (2015-2021)



Developed with Ian Fenty

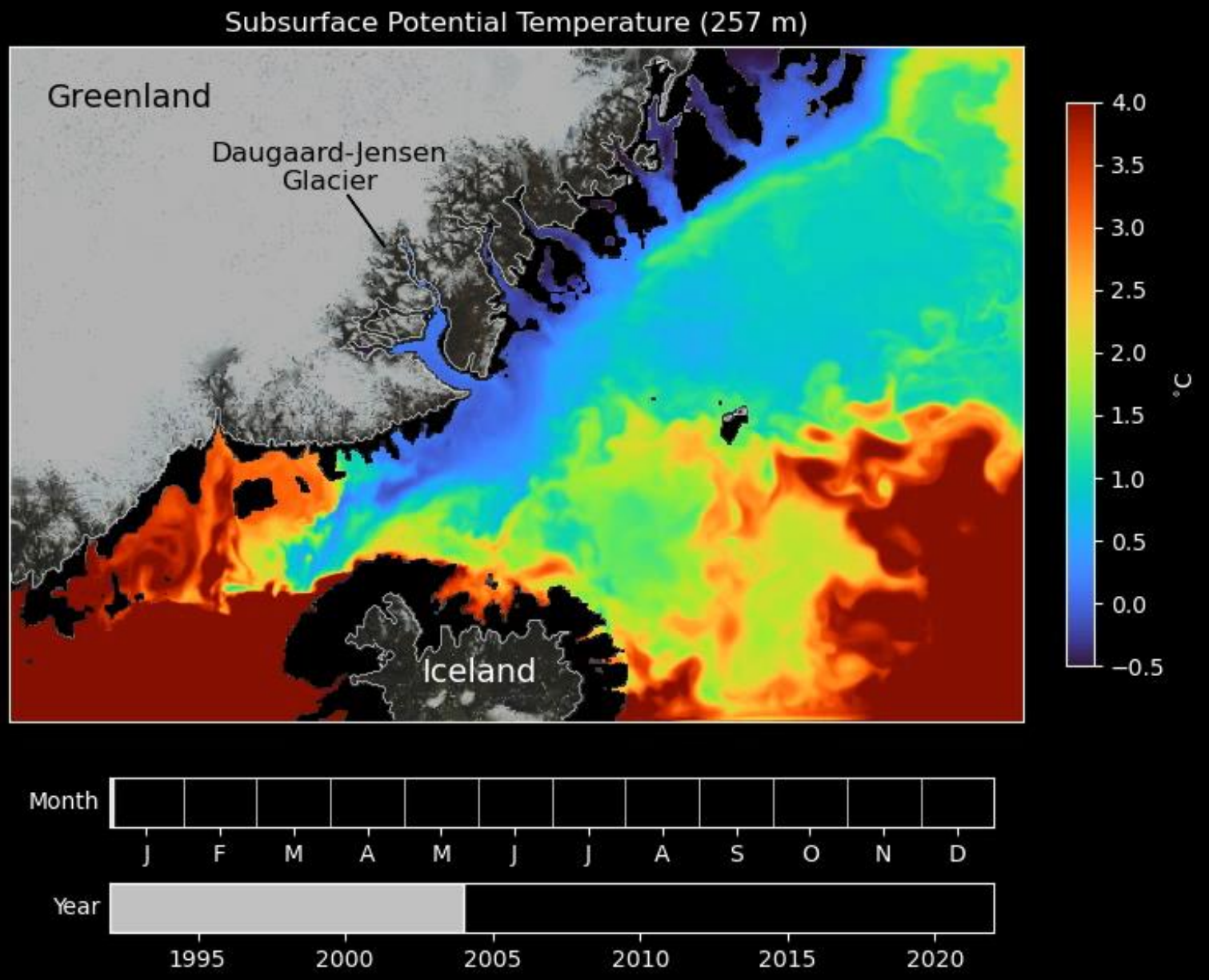
Case Study: Greenland Fjords

- Parent Model:

  LLC270
- Resolution:

  1080
- Time Duration:

  30 Years (1992-2021)



Developed with Ian Fenty & Ala Khazendar (JPL);

Case Study: Greenland Fjords

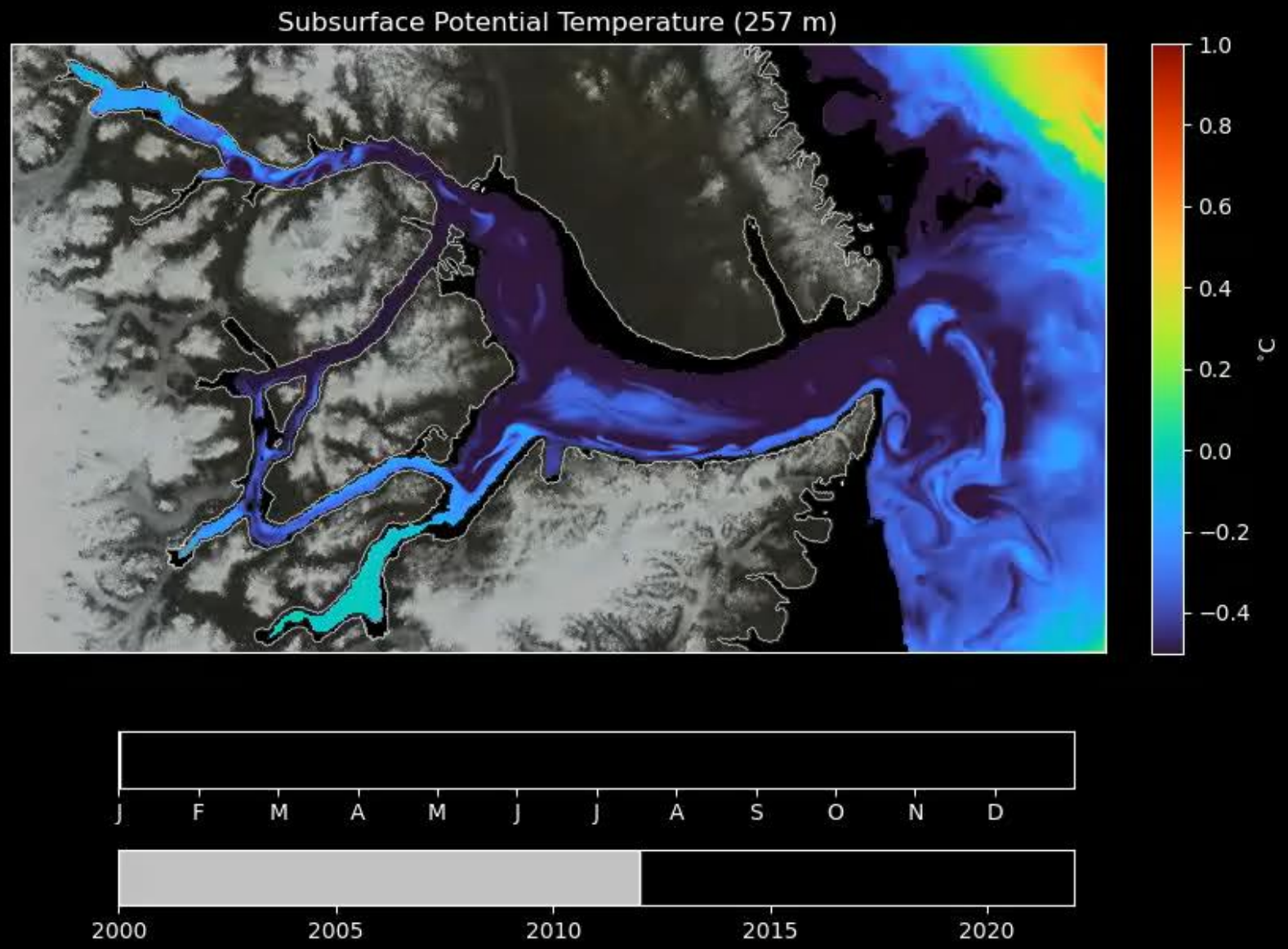
- Parent Model:

  1080 East Greenland
- Resolution:

  500m
- Time Duration:

  22 Years (2000-2021)

  Ice front melt is driven by iceplume package



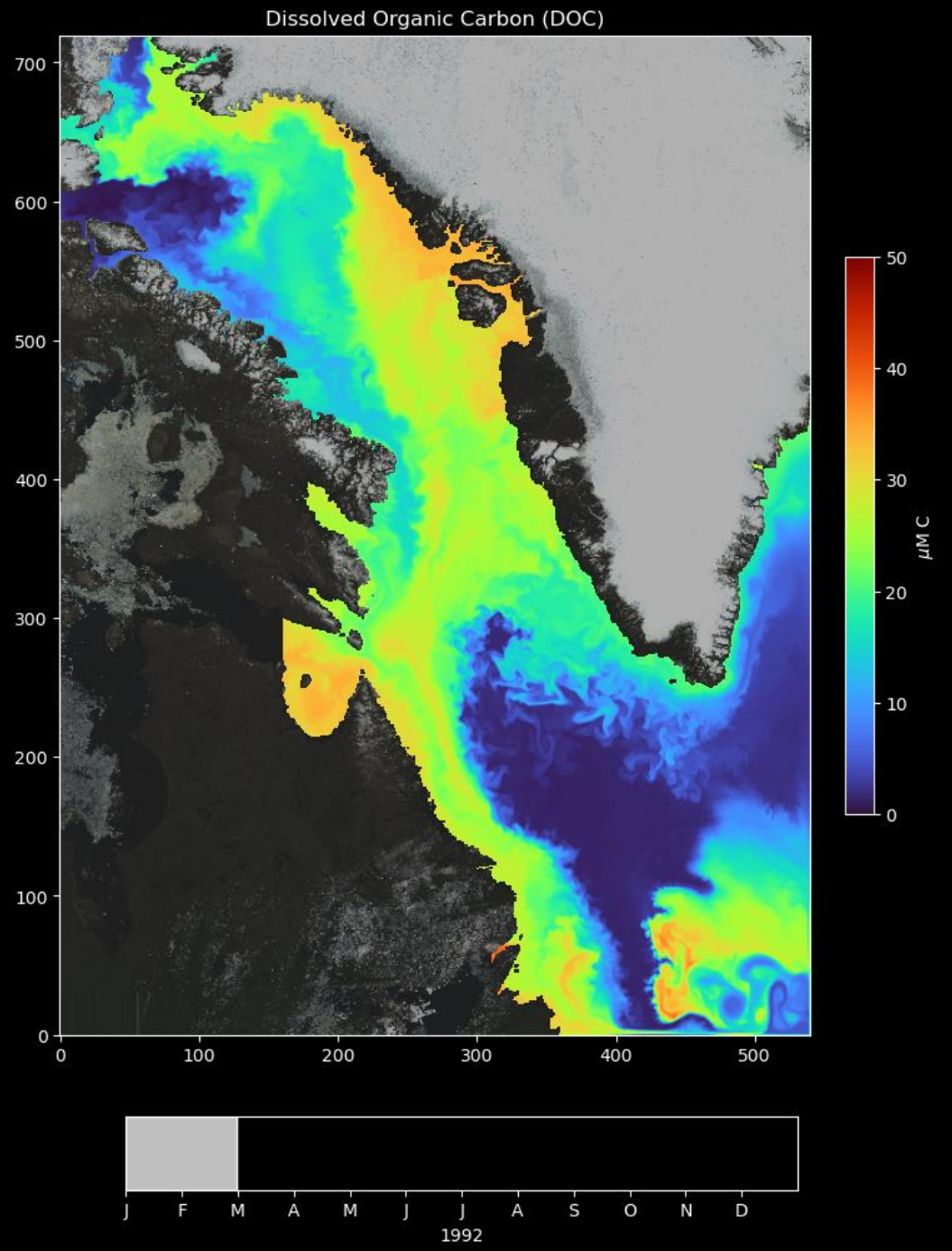
Ice front melt from An Nguyen and Kiki Schultz (UT Austin)

Downscaling with Darwin

- BGC package contains 31 tracers and 2 additional external forcing fields
- Parent Model:

  ECCO Darwin (LLC270)
- Downscaled Resolutions:

  1080, 500m



Developed with Dustin Carroll (MLML/JPL)

Conclusions

- New diagnostics package for MITgcm
  - Output only where you want it!
- Opens up the possibilities for new downscaled model efforts from ECCO solutions

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