



CPT: Ocean mixing processes associated with high spatial heterogeneity in sea ice and the implications for climate models

(summary of NCAR activities)

Bruce Briegleb, Marika Holland, Gokhan Danabasoglu (NCAR)

In collaboration with UAF and GFDL



NCAR is sponsored by the National Science Foundation

Summary

- CESM uses a multi-category sea ice model which calculates category dependent ice-ocean fluxes per grid cell
- Currently these fluxes are aggregated and a single flux is provided to the ocean model
- This CPT examines how resolving the sub-gridscale heterogeneity in ice-ocean fluxes can influence ocean mixing, sea ice mass budgets, and ultimately climate

Plan

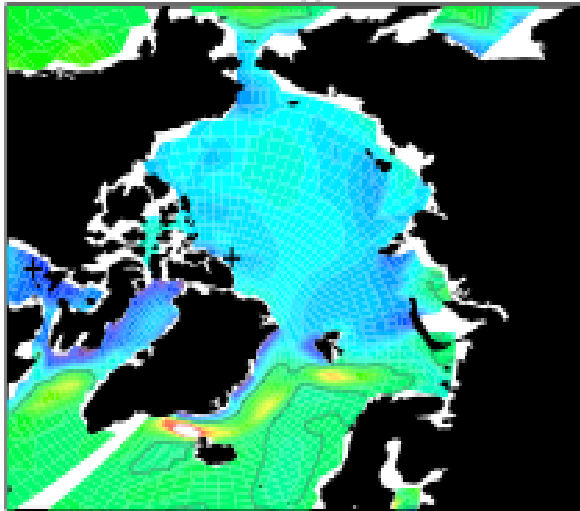
- Implement Multi-Category Ocean Grid (MCOG) scheme in both 3D and 1D frameworks, starting with the former
- Validate MCOG in the 1D framework using field observations
- Conduct long runs of the 3D climate model implementation and determine influence on climate and biogeochemical feedbacks

Present Status

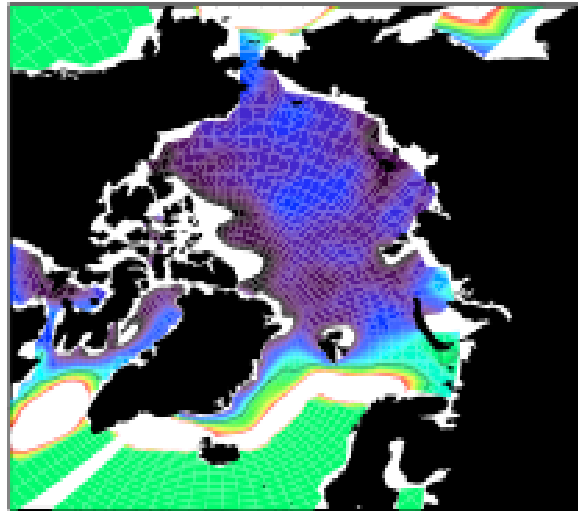
- MCOG scheme has been implemented in CESM
 - Includes ice, ocn, coupler mods to transfer and use ice category-dependent and open water fluxes
 - Multiple KPP calculations done (for each subgrid column) to determine diffusivities and viscosities
 - The diffusivities, viscosities are then aggregated over category fraction and applied
 - A 100 year, 3degree, ice-ocn coupled run with normal year forcing has just been completed

VERY Preliminary Results

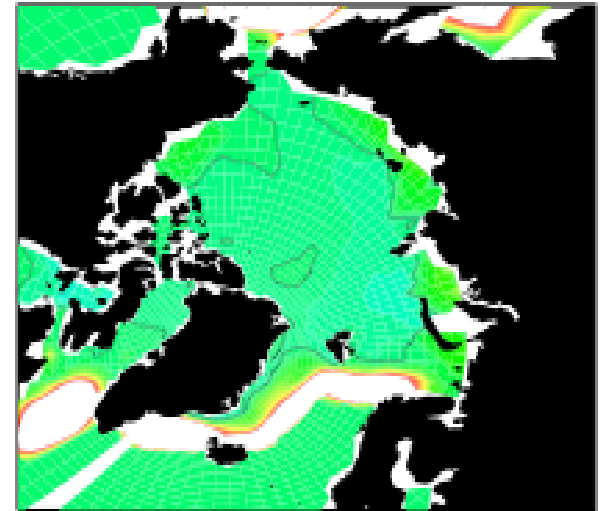
SFWF Agg Jan



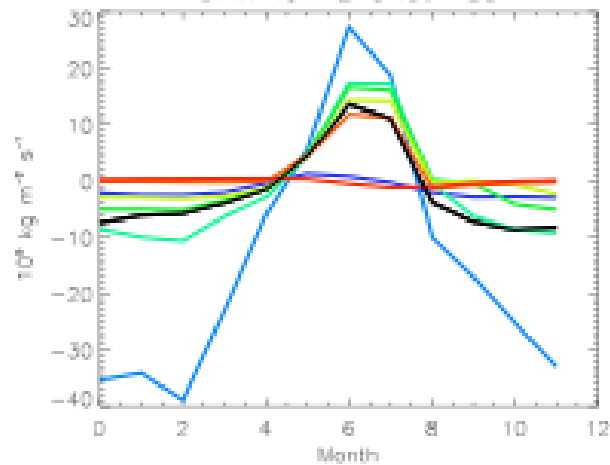
SFWF Cat1 Jan



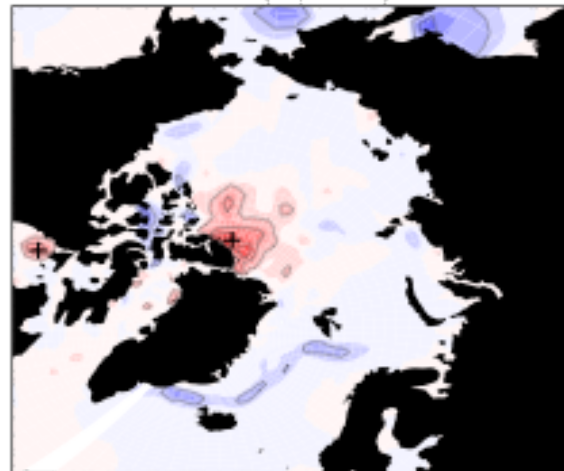
SFWF Cat5 Jan



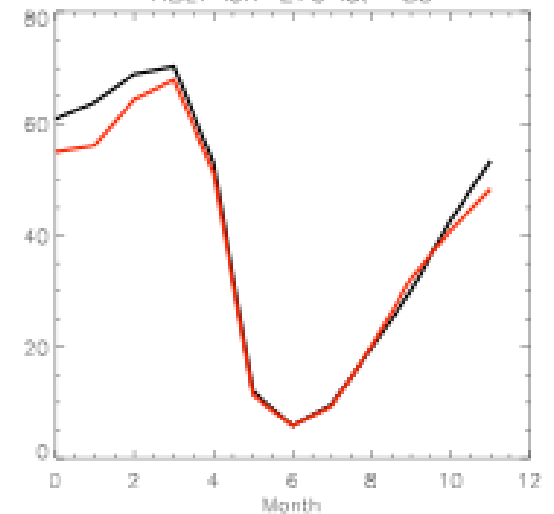
SFWF lon=270 lat= 83



HBLT Diff (Exp-Cont) Jan



HBLT lon=270 lat= 83



Next Steps

- Closer look at existing simulation
- Fully coupled integrations
- BGC Integrations
- Sensitivity to implementation
 - Instead of aggregating diffusivities/viscosities, perform column KPP tracer computation and aggregate the tracer values
 - Revisit how (where) certain ice-ocean fluxes are applied (frazil ice formation, surface melt flux)
 - Category implementation – is a OW/thin/thick ice subgrid categories adequate? Etc.

VERY Preliminary Results

