Slab Ocean Model (SOM)

(A Public Service Announcement from the PCWG.)

- GenSOM (i.e. DOM-SOM sequence) not currently supported.
- Why?
  - No information under the sea ice from the DOM run.
  - Ad-hoc Q-Flux corrections under the sea ice. This means that the Q-flux changes as the sea ice changes.
  - Did not use the full dynamic-thermodynamic ice model.
- What Now?
  - POP_FRC: Construct Q-Flux from fully-coupled run.
  - A self-consistent dataset including information under the ice.
  - Uses full sea ice model.
  - More analogous to the fully-coupled system.

Sea Ice Model Update

David Bailey and Marika Holland, NCAR

- Community Ice CodE (CICE) 4.0 Base Code
- Delta-Eddington Radiative Transfer in sea ice and snow. (Briegleb and Light)
- Melt Pond Parameterization. (Bailey and Holland)
- Arbitrary Number of Tracers (for example – age, melt ponds, aerosols).
- Aerosol cycling and deposition on sea ice / snow.

New Albedo (delta-Eddington) Formulation

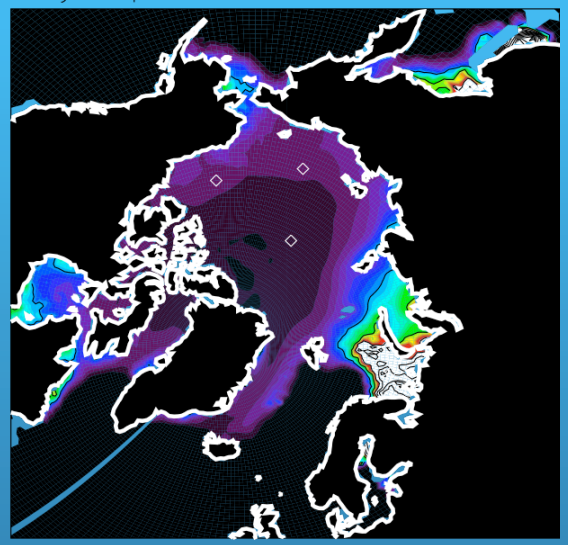
- Snow and ice albedos now a function of zenith angle and optical properties of snow, sea ice, and melt ponds.
- Tunable non-melting and melting snow grain radius -> target albedos.
- Accounts for the effect of impurities (aerosols, algae, etc) in the snow and ice.
- No snow-aging at this stage.

Aerosol cycling implementation

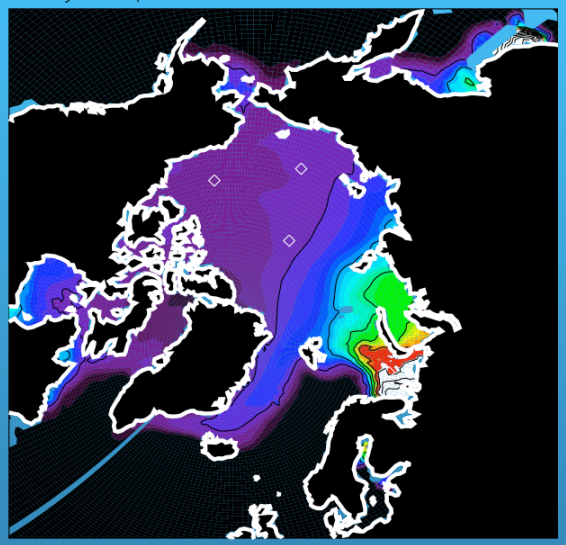
Four aerosol reservoirs in the vertical
Aerosol cycling due to ice transport, vertical melt/snow-ice formation
Melt water scavenging
Six aerosols – 2 black carbon (hydrophilic/phobic), 4 dust
Currently affects radiative transfer
Receiving aerosol deposition from CAM
Near-term (months) work will link to ocean iron deposition

With prescribed Aerosol deposition

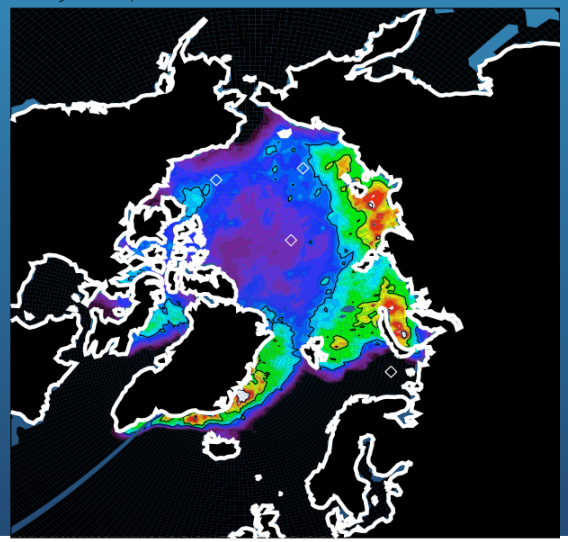
Hydrophilic BC SNOW SSL JAN



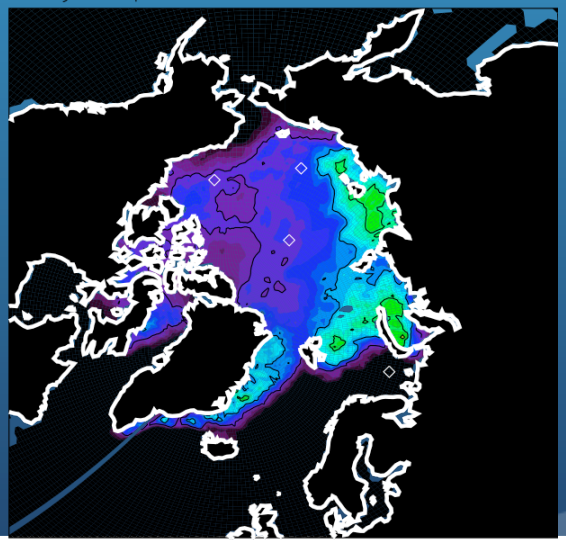
Hydrophilic BC SNOW INT JAN



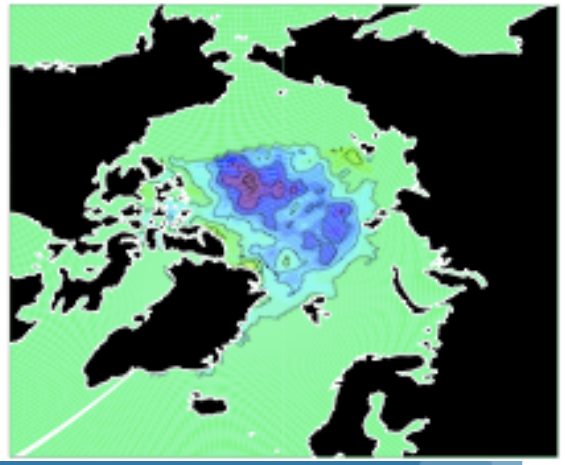
Hydrophilic BC SNOW SSL SEP



Hydrophilic BC SNOW INT SEP



albedo diff b40.004o_aero−b40.004o AUG

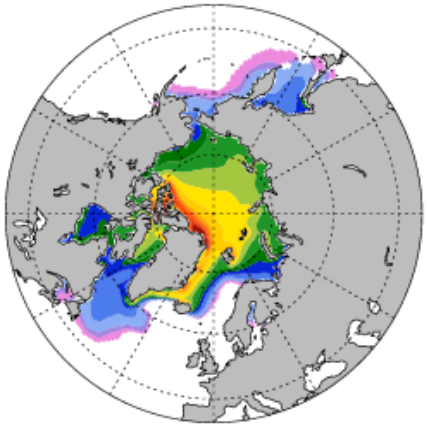


Sea Ice Results from Tracks

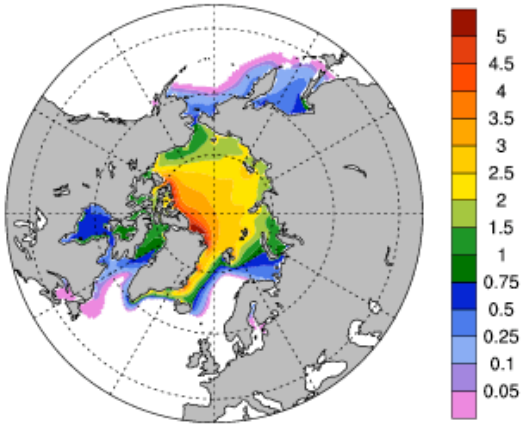
- Important metrics for sea ice:
  - Central Arctic thickness (2.5 – 3 m near the pole).
  - North Atlantic and North Pacific sea ice extent.
  - Snow cover melts away entirely nearly every summer.
  - Surface energy budget over ice within ballpark of limited observations.

Tracks on the Ice

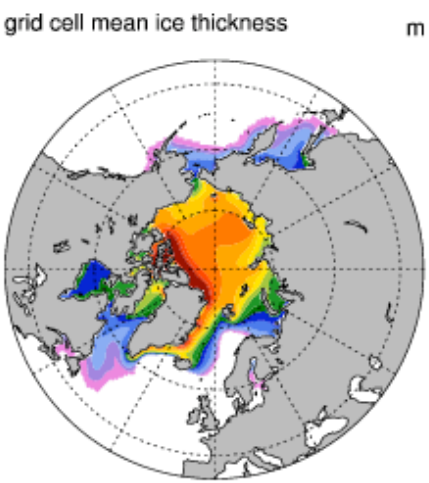
Track V



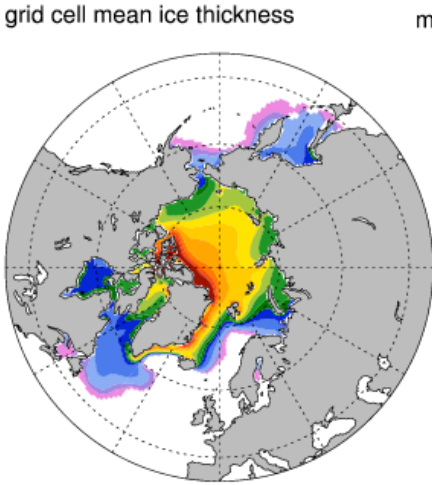
Track 0

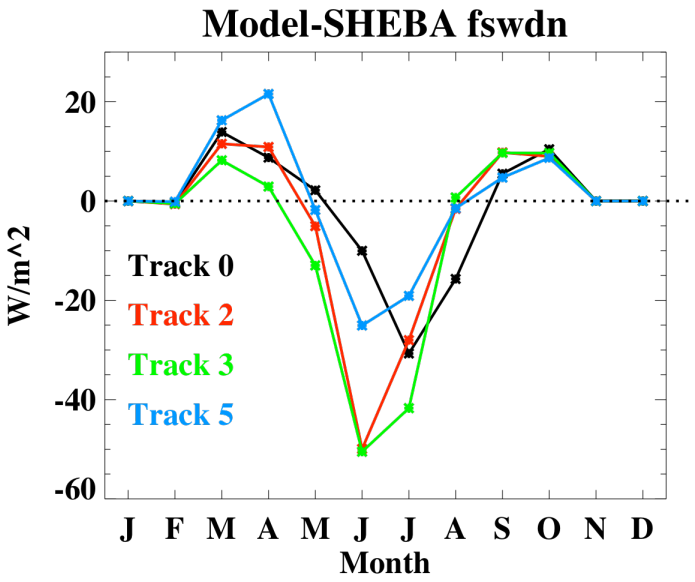


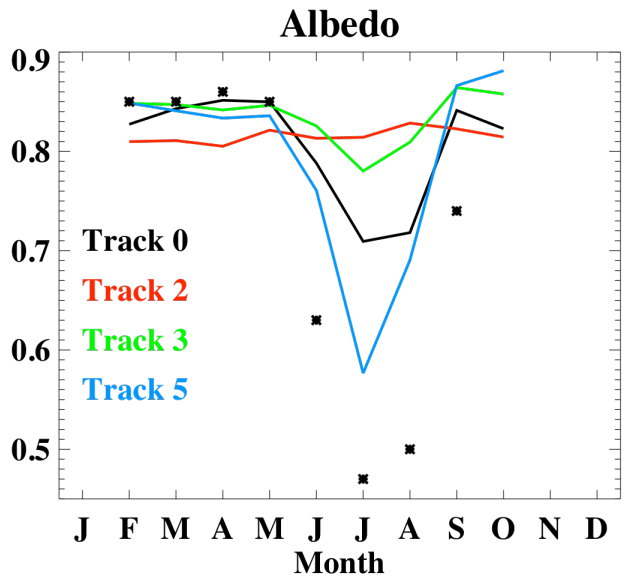
Track IIb

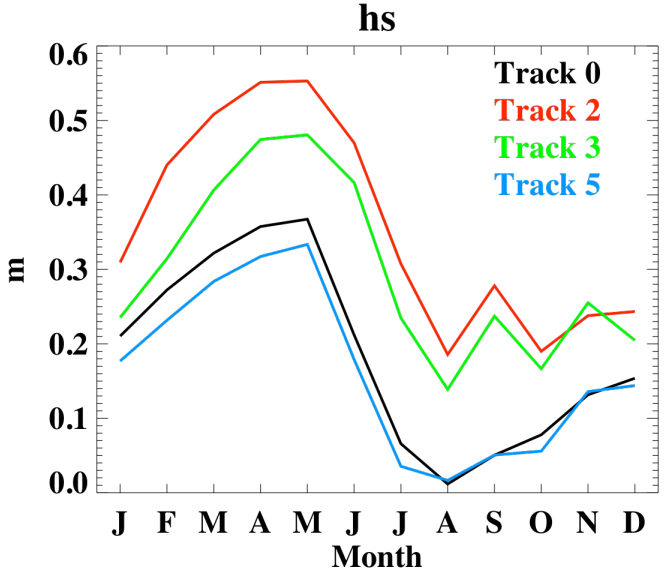


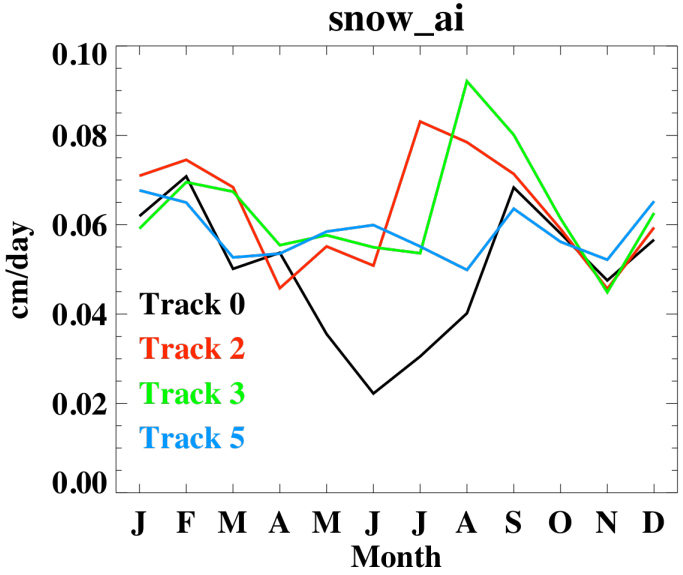
Track III











Tracks on the Ice

Summary

- New SOM and CICE physics
- Aerosols have a limited impact.
- Track V looks most promising compared to CCSM 3.5 wrt the sea ice
- Southern Hemisphere sea ice extent looks much better than CCSM 3.0 in all (not shown). Thickness?

And Beyond CCSM4?

- Ice model to-do list (Feb, 2006):
  - improved radiation scheme (DONE)
  - dynamic stability improvements (DONE)
  - inclusion of biogeochemistry (In Progress)
  - sea ice "hydrology" including melt ponds, brine pockets and drainage, percolation and snow-ice formation (Some progress)
  - snow metamorphosis; snow aging (June, 2007; ??)
  - blowing snow parameterization (??)

- New applications that we are/may contribute to
  - regional modeling (POP-ROMS/CAM-WRF)
  - weather-climate (WRF) scale interactions
  - high-resolution coupled integrations
  - Do these new areas have specific model development needs?
  - How do we entrain the necessary communities?

- More generally - What is needed to accelerate model developments? What is needed to identify new areas?