



High resolution runs with RASM

Andrew Roberts

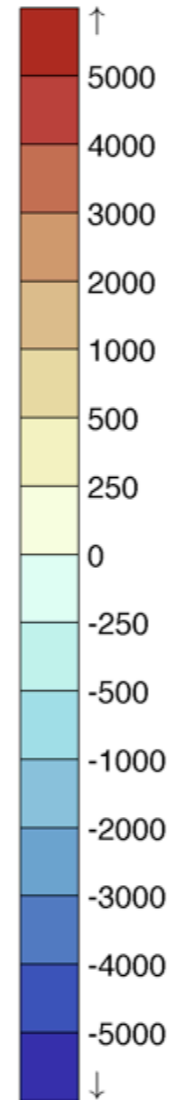
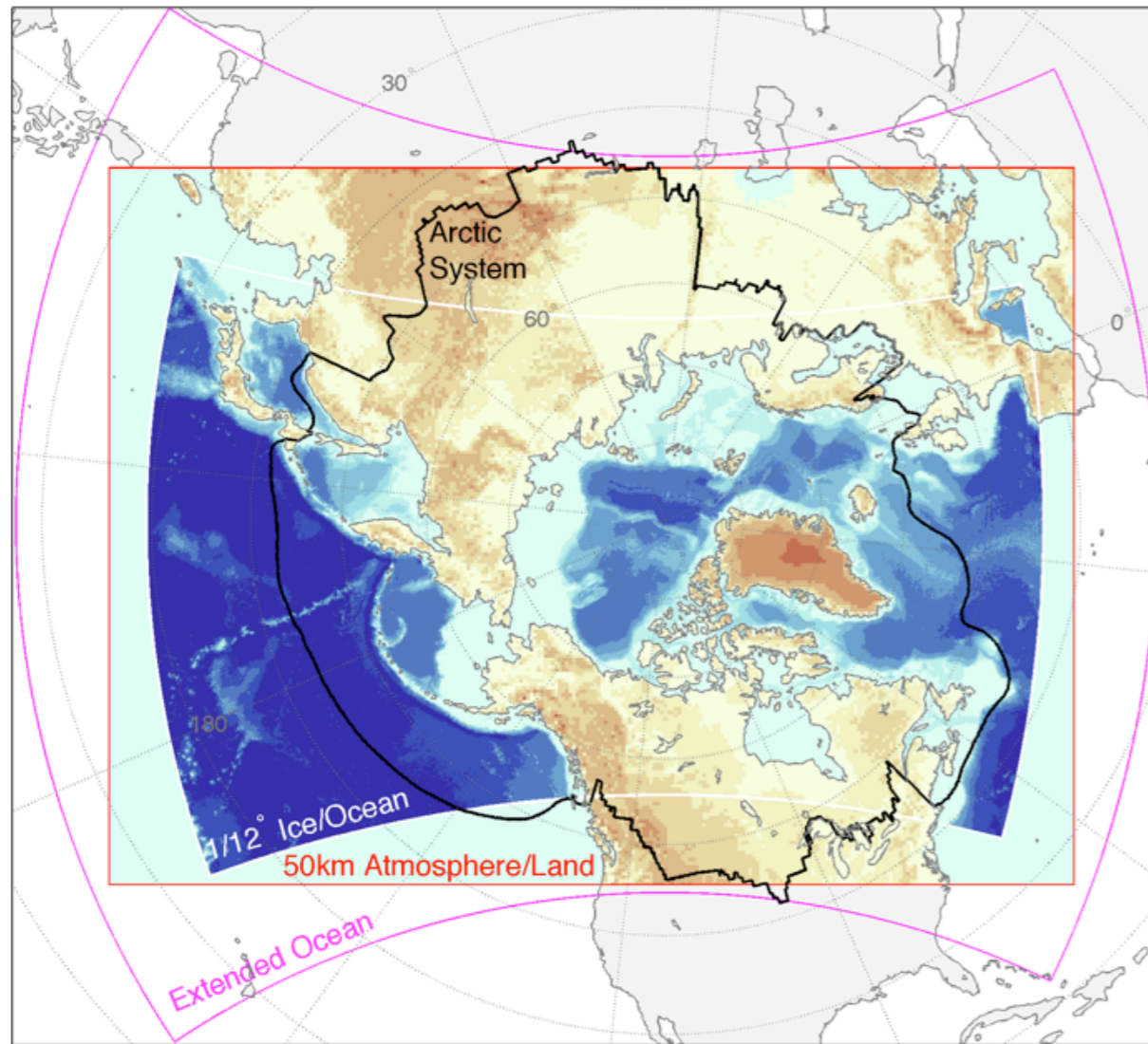
Naval Postgraduate School

Bart Nijssen, Alice DuVivier, Robert Osinski, Tony Craig, Joe Hamman

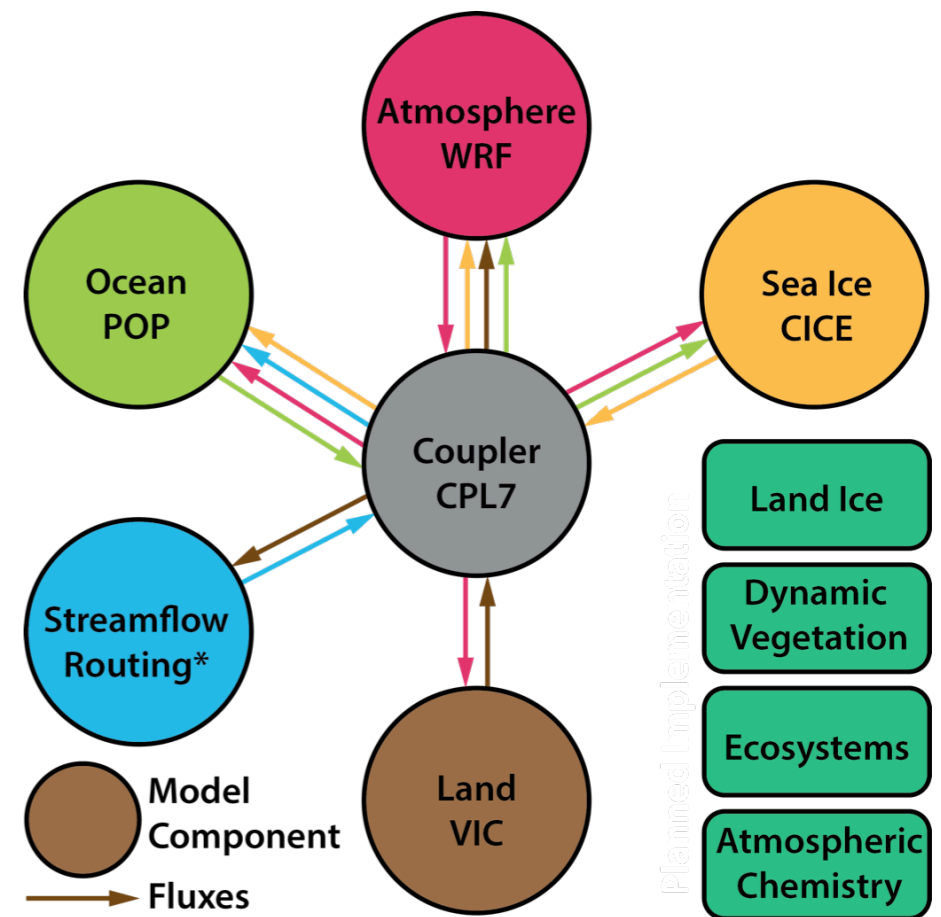
Mimi Hughes, Brandon Fisel, Saffia Hossainzadeh, Jeremy Fyke, Michael Brunke,
Jackie Clement-Kinney, Anna Carolina Barbosa, Thomas Mills, and more.

Pls: Wieslaw Maslowski, Andrew Roberts, Bill Gutowski, Xubin Zeng, Bill Lipscomb, Bill
Robertson, Slawek Tulaczyk, John Cassano, Dennis Lettenmaier

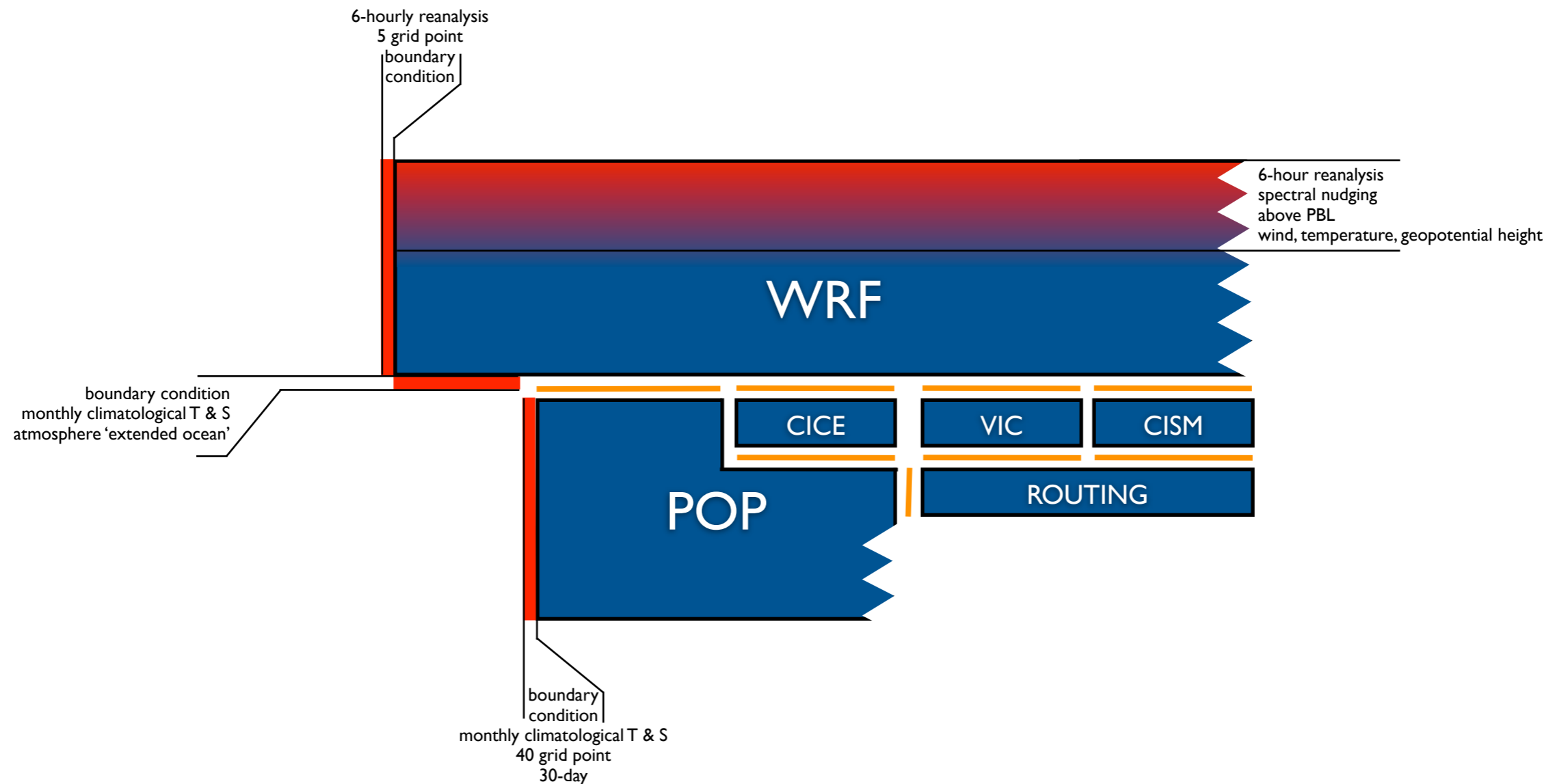
The Regional Arctic Climate Model (RASM)



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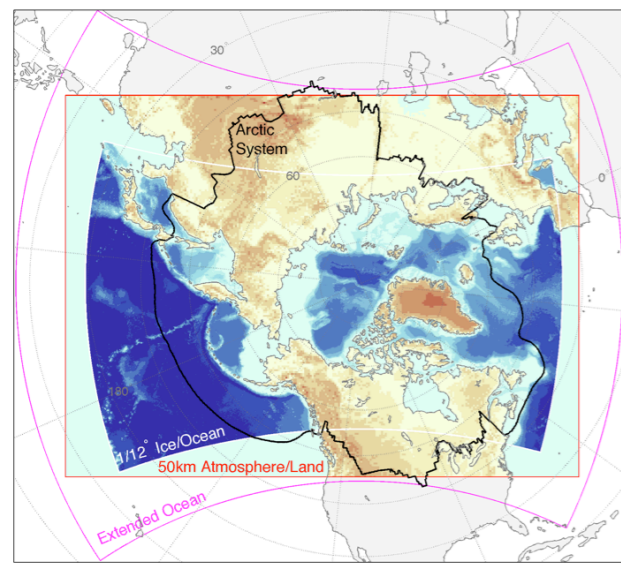


RASM configuration vs CESM configuration



- Red line** - Atmospheric and oceanic forcing
- Orange line** - Coupling channels between component models
- Blue line** - Component models

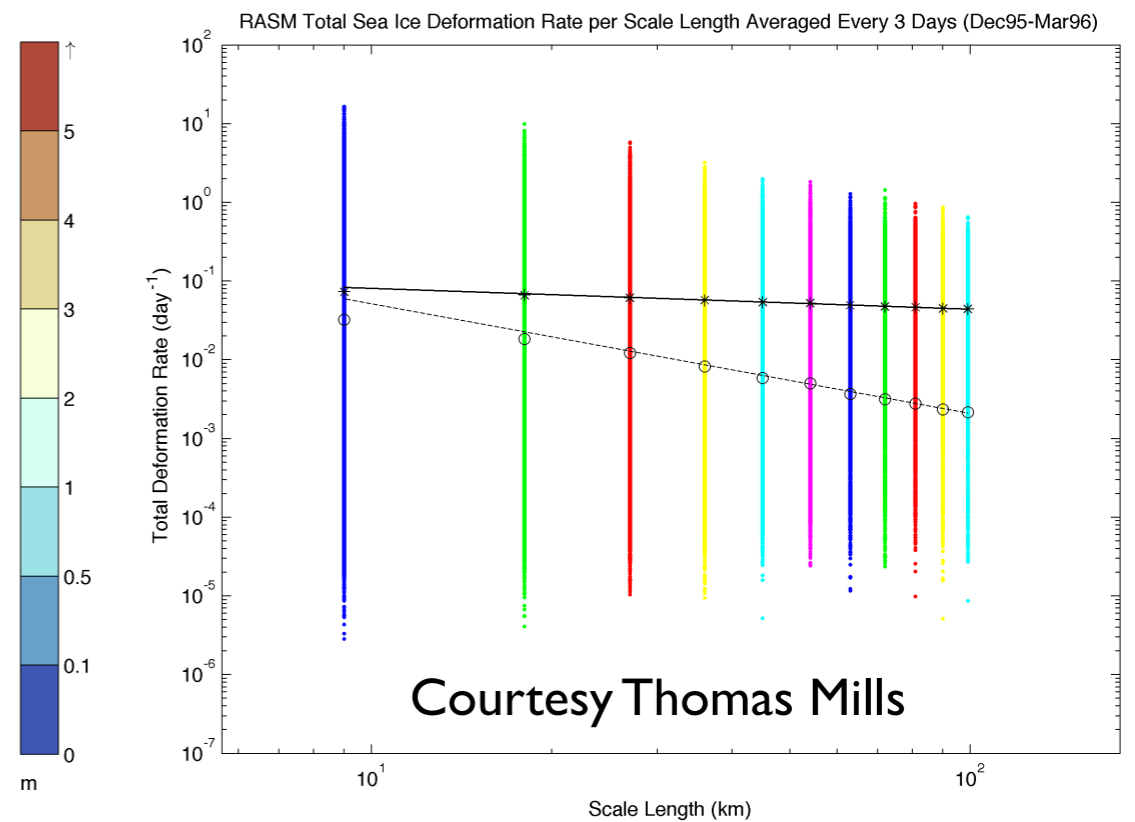
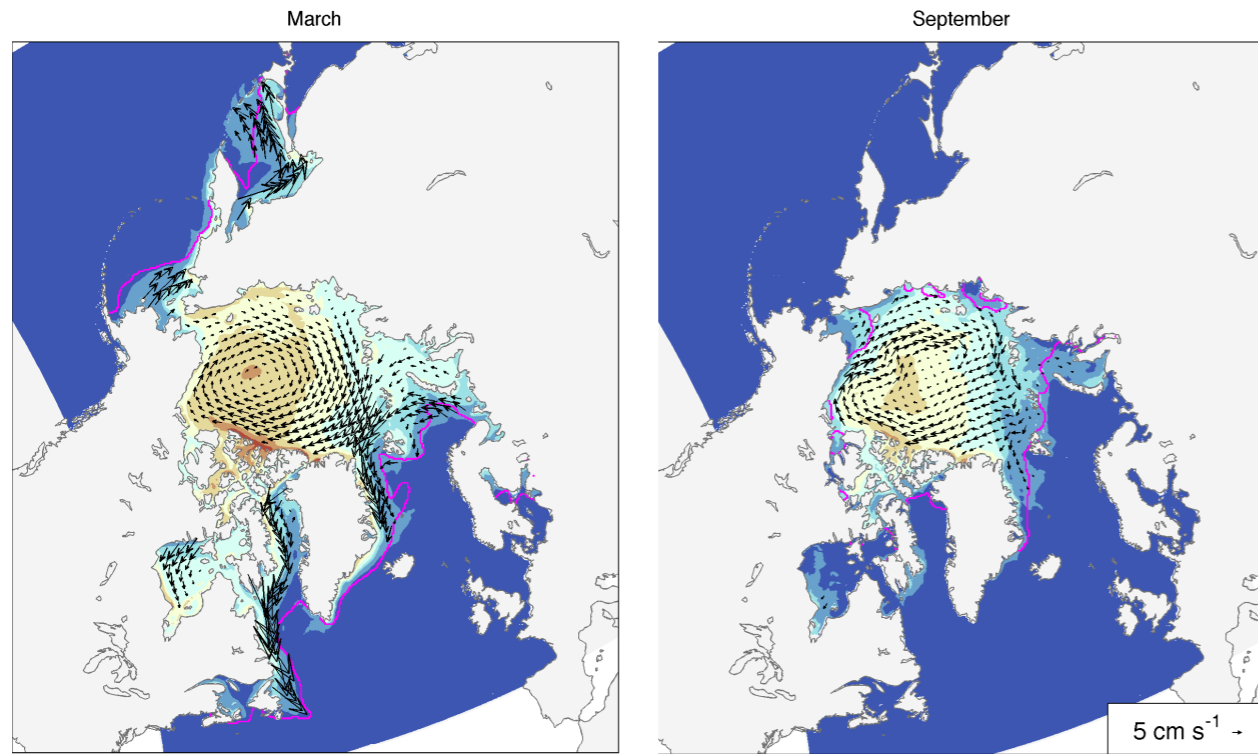
RASM configuration vs CESM configuration



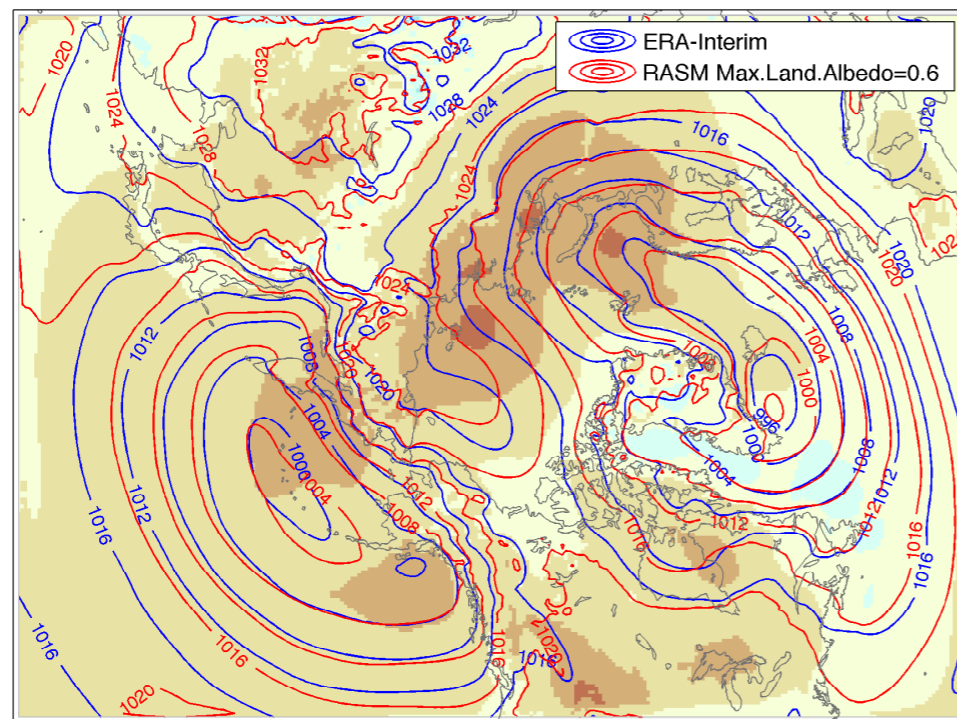
Component	Model/Code	Configuration
Atmosphere	WRF	50km, 35 levels, dt=2.5mins
Land Hydrology	VIC	50km, dt=20mins
Ocean	POP	9km, 45 levels, dt=8/8/4mins
Sea Ice	CICE	9km, 5cats, dt=20mins/xndt_dyn=4
Coupler	CPL7	20min coupling

- RASM uses the same software and scripting framework as CESM
- Using different ocean/atmosphere grid configurations in a regional setting
- There are no poles in the component model grids
- Passing $\log(z_0)$ through the coupler to WRF from VIC, POP and CICE
- Using CCSM framework, but transitioning to CESM version
- WRF and VIC are now compliant with CESM standards (almost)
- Updates are being committed to the CESM repository from RASM

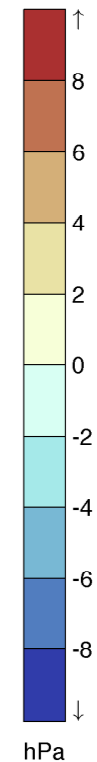
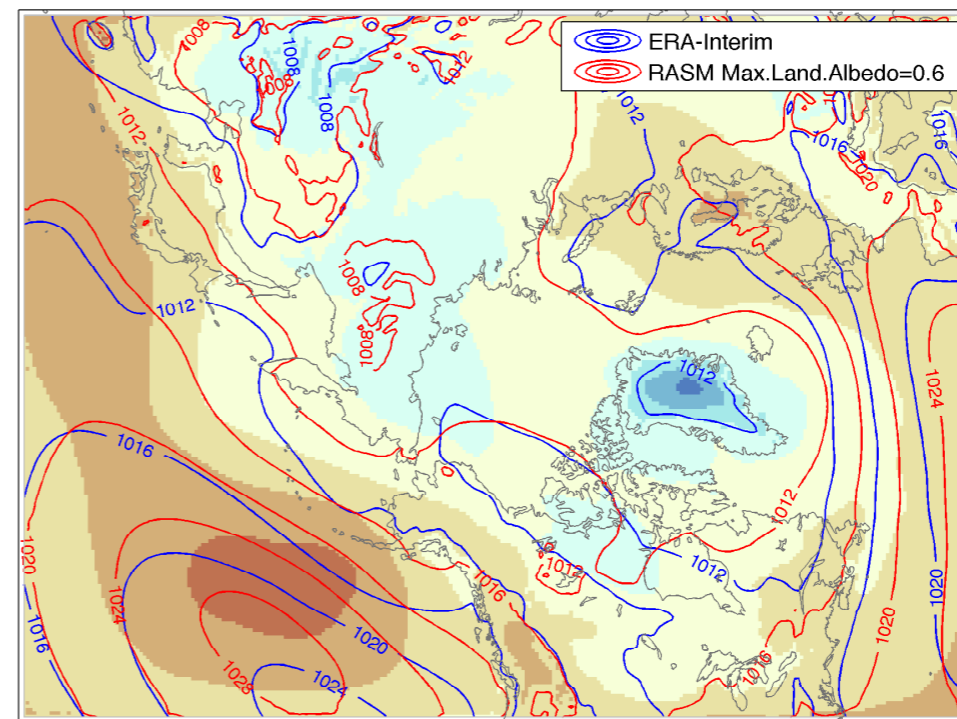
Characteristics of recent simulations in RASM - Coupled



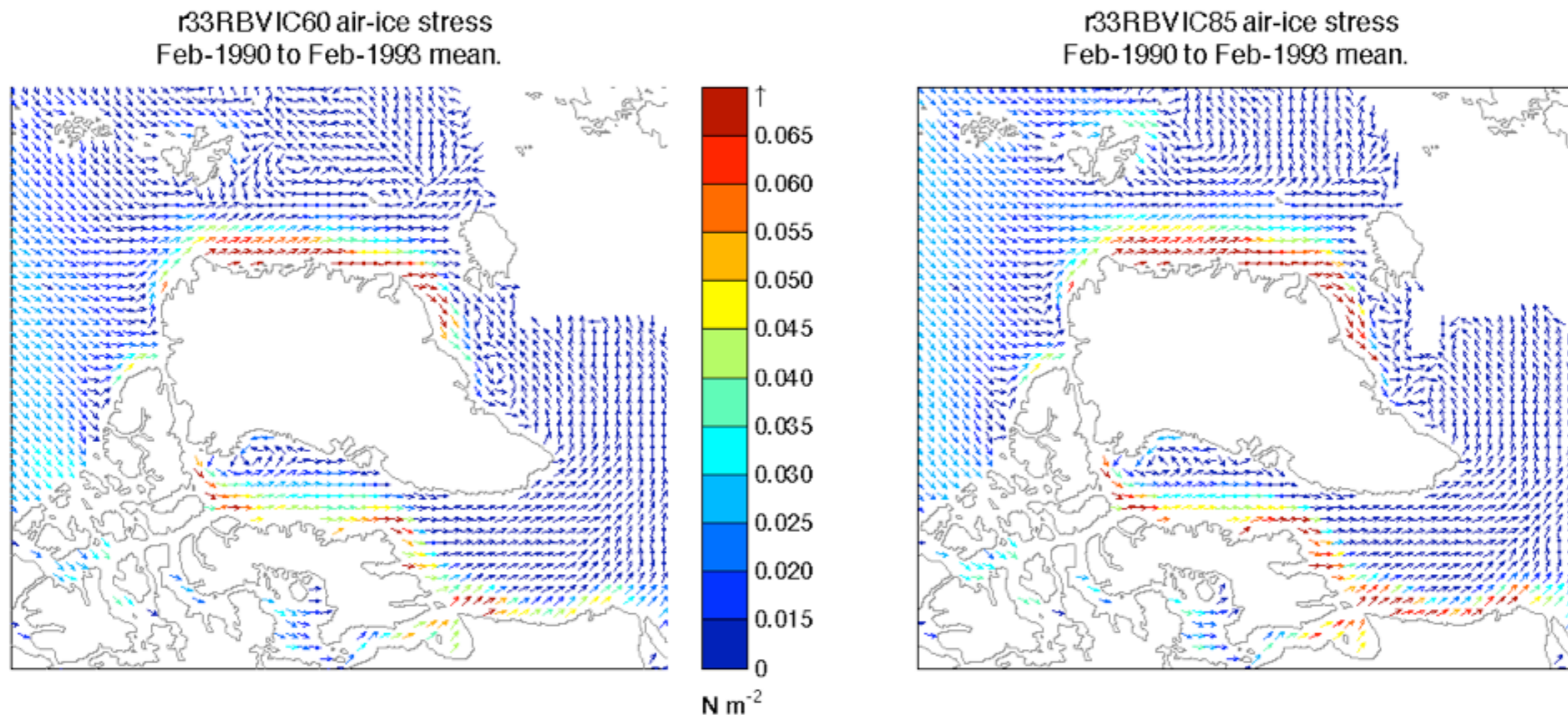
DJF PMSL and difference from ERA-Interim 1990-2000



JJA PMSL and difference from ERA-Interim 1990-2000

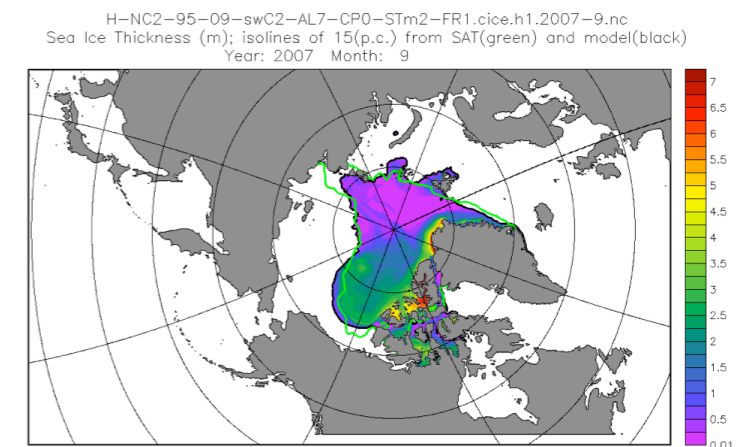
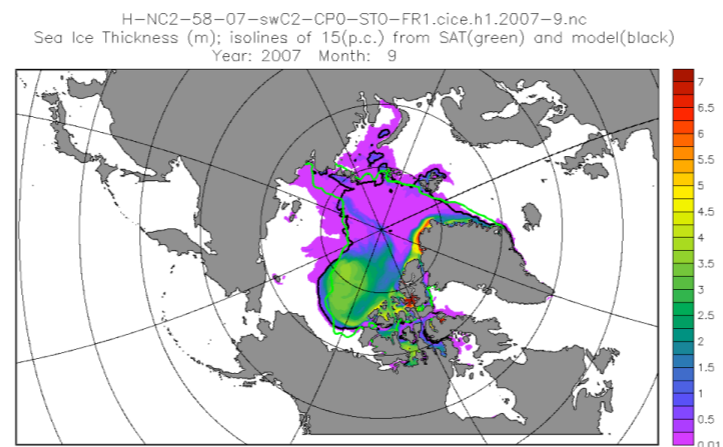
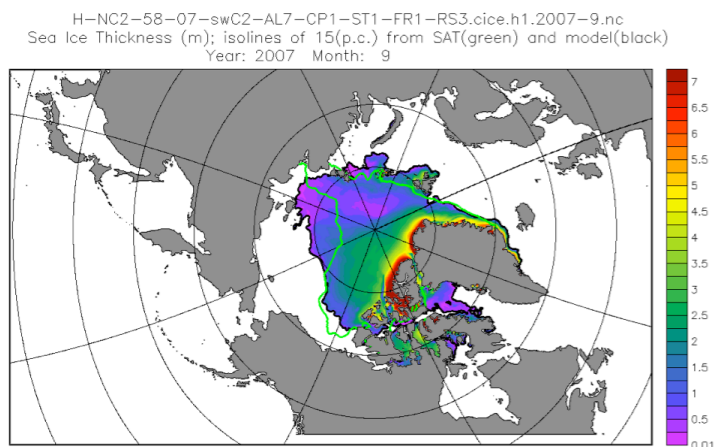
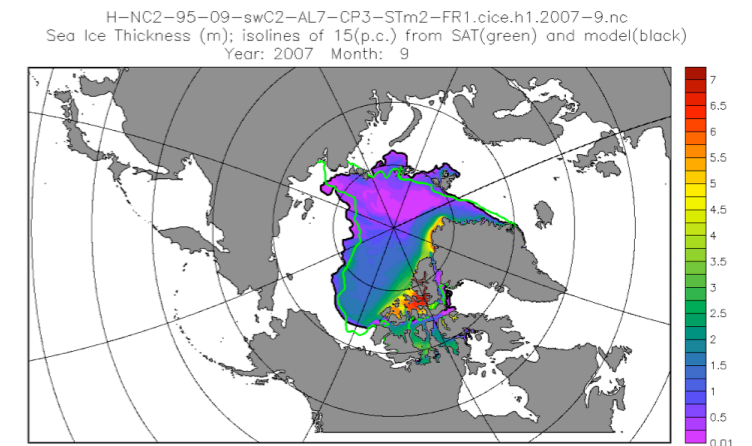
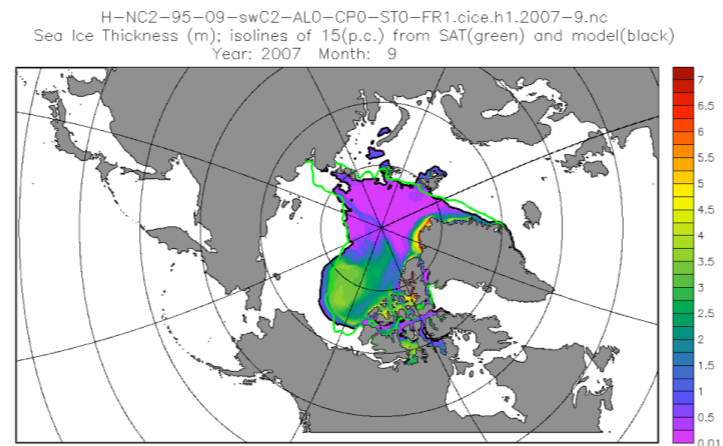
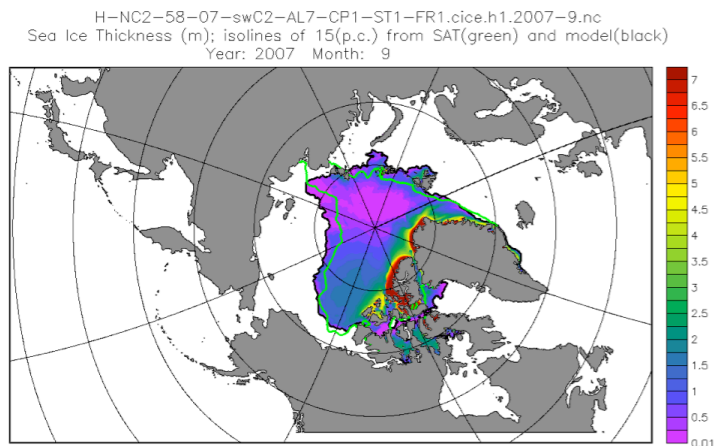


Characteristics of recent simulations in RASM - Coupled



Difficulties handling strong wind speeds off the Greenland coast

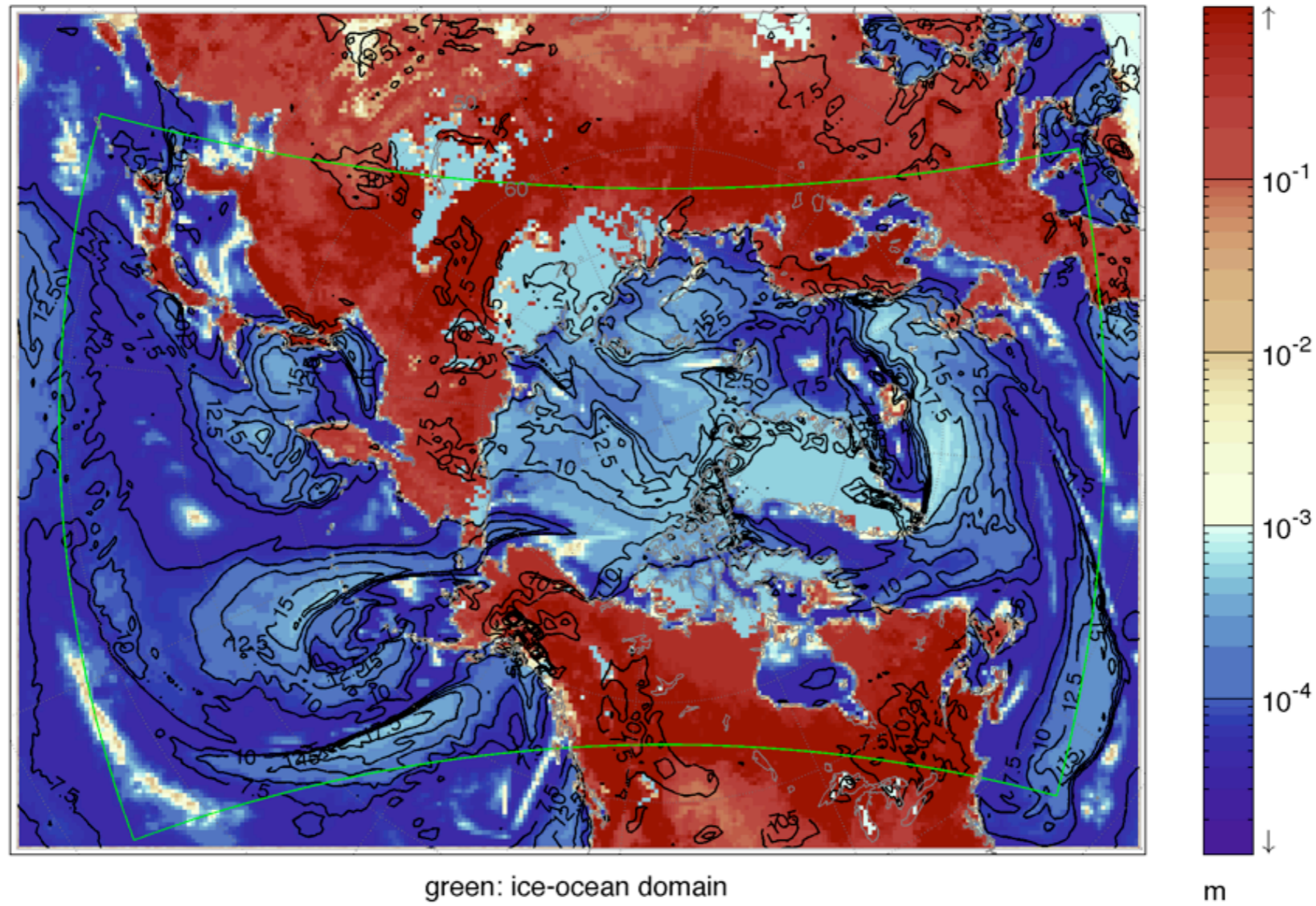
Characteristics of recent simulations in RASM - Ice-Ocean



Parameter space tests with CORE 2 by Robert Osinski and Wieslaw Maslowski

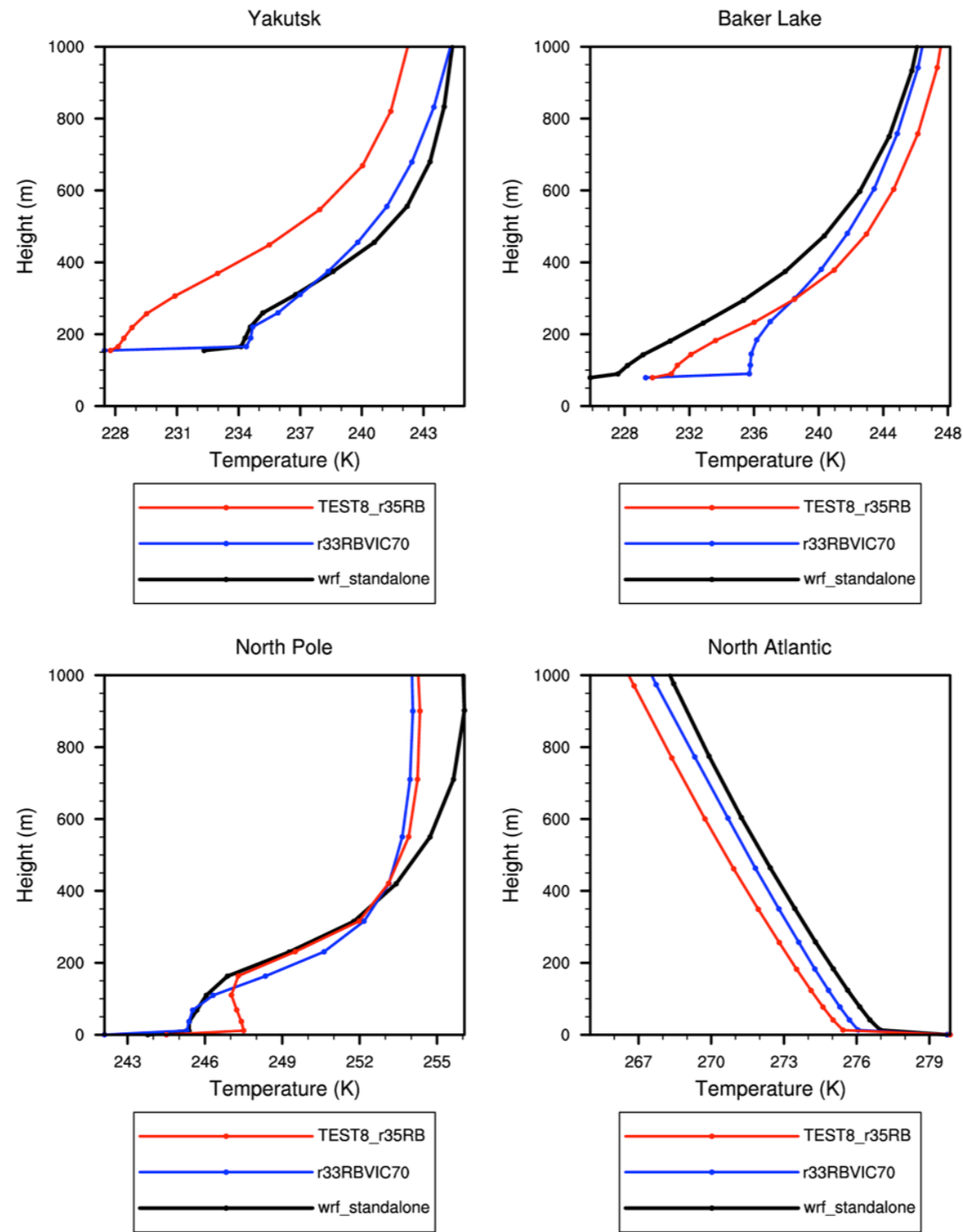
WRF stability calculations: Passing $\log(z_0)$ through the coupler

Shaded: Roughness length passed to WRF 06-Sep-1989 00Z
Contour: Wind speed (contour)



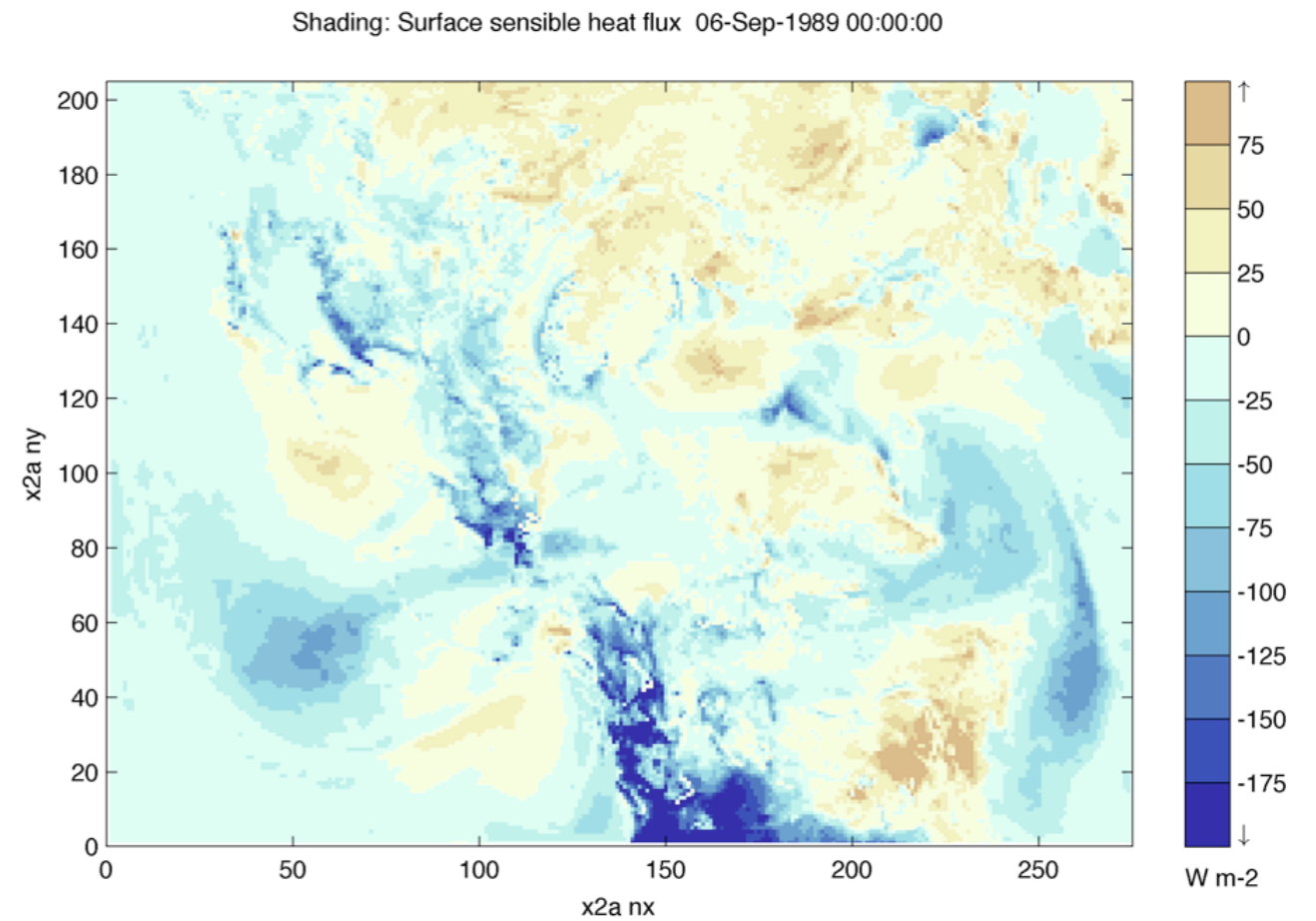
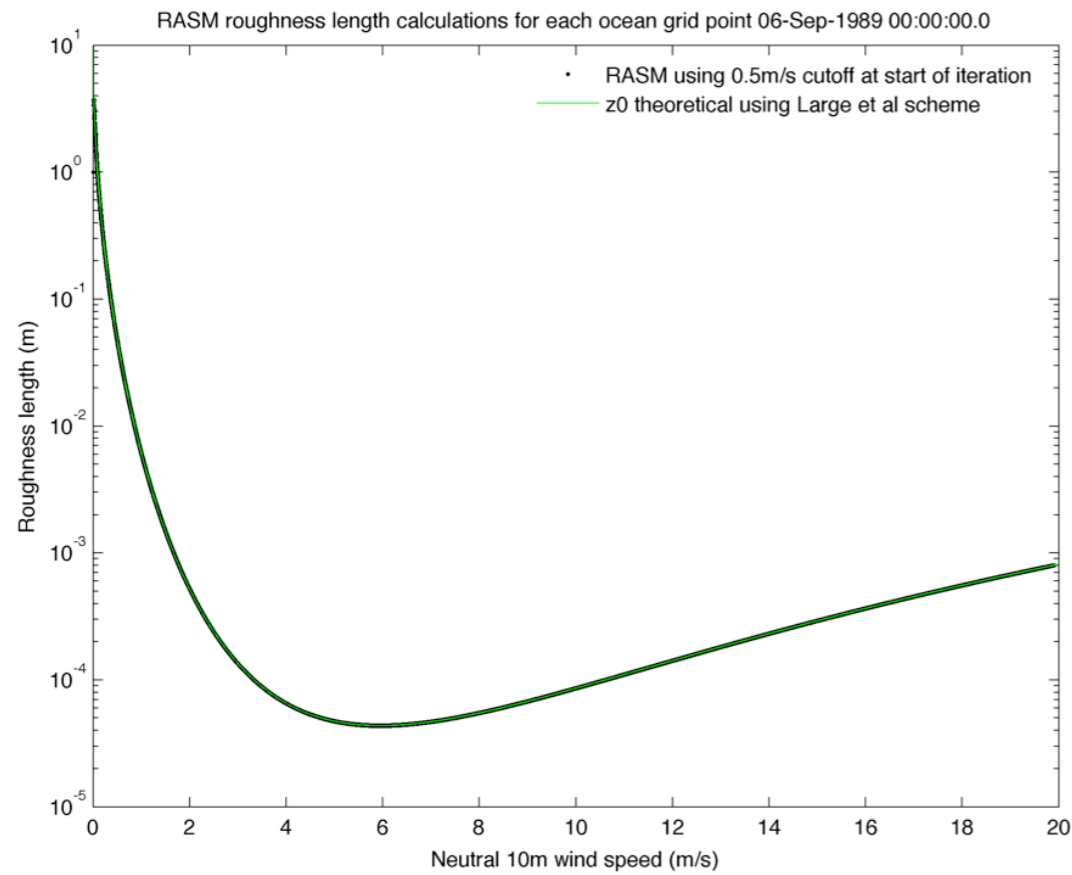
WRF stability calculations: Passing $\log(z_0)$ through the coupler

Compare lowest 1000m for wrf-1990-01-06Z

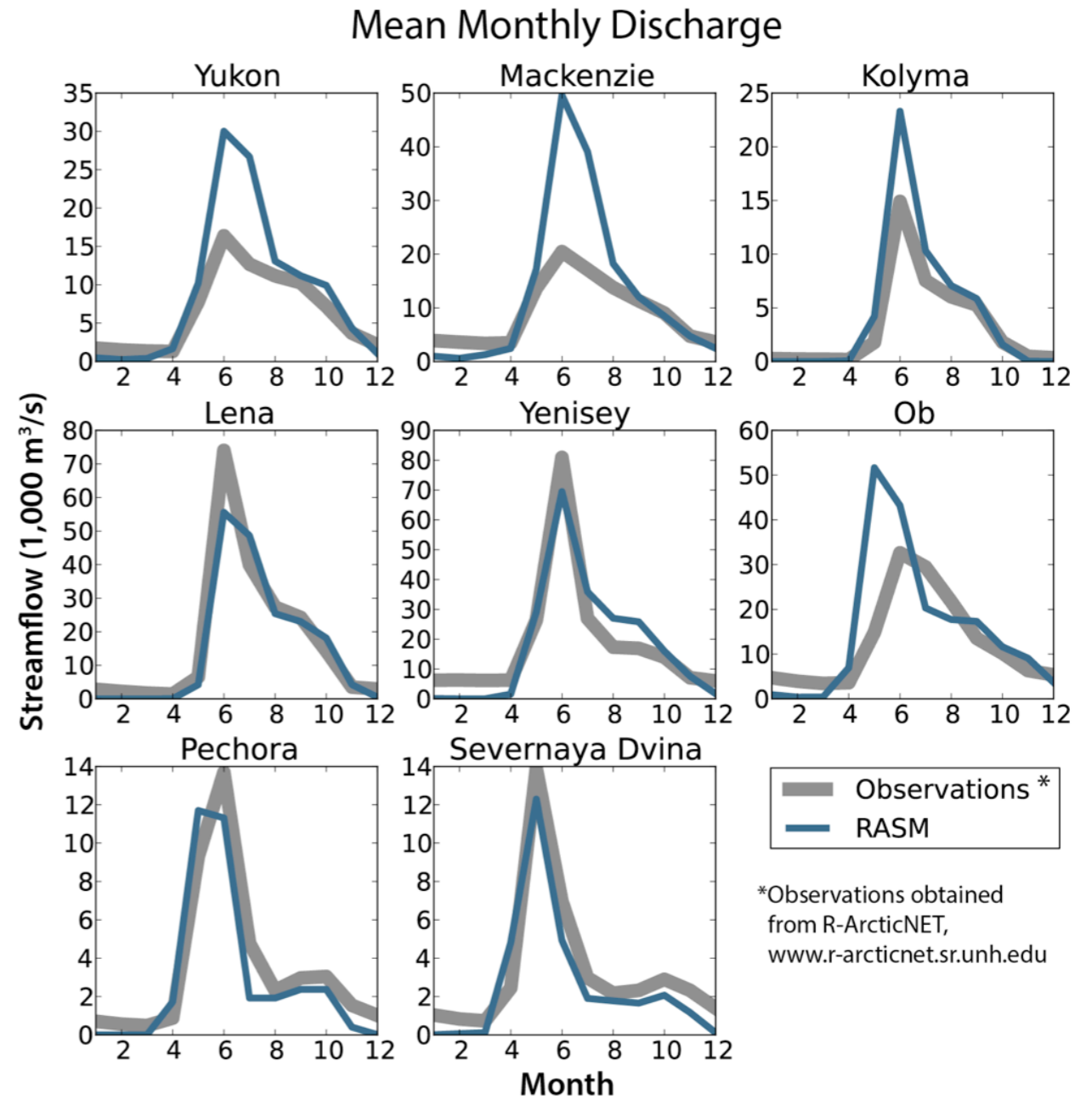


Courtesy Alice DuVivier

WRF stability calculations: Passing $\log(z_0)$ through the coupler

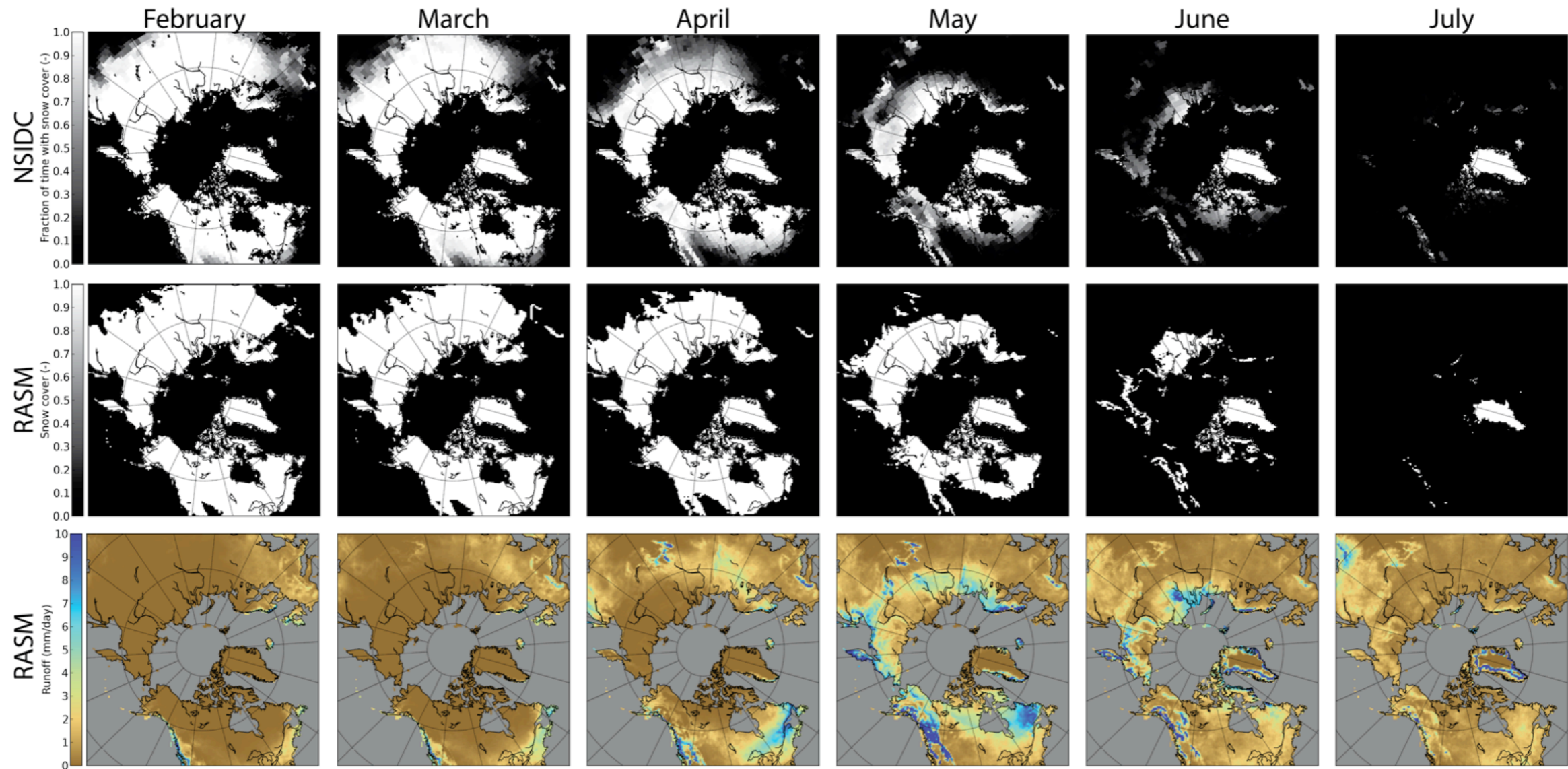


Adding the streamflow model to RASM



Courtesy Bart Nijssen and Joe Hamman

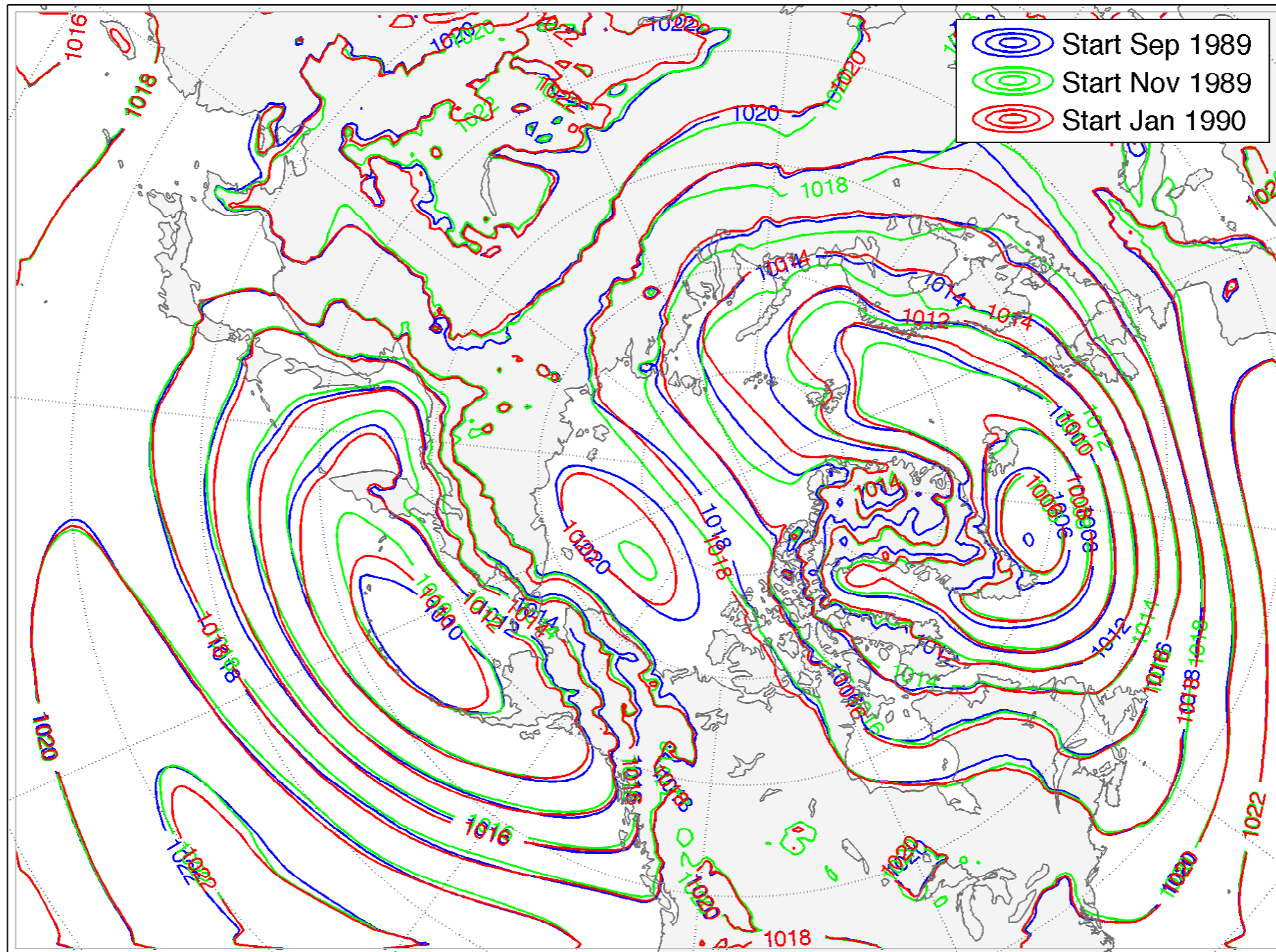
Adding the streamflow model to RASM



Courtesy Bart Nijssen and Joe Hamman

How constrained is the climate in RASM?

1990-12 to 1995-12 Mean Sea Level Pressure (hPa)



Three ensemble members started with identical ice-ocean initial conditions, with 2-month staggered initialization, results in almost identical sea ice volume after 6 years using typical WRF spectral nudging.