



# Sea Ice and Polar Climate in CESM1.5

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# CESM-CICE5

- \* Same infrastructure as CICE4
- \* New thermodynamics, dynamics, melt ponds, and BGC.
- \* Default thermo is now mushy-layer (Turner and Hunke 2015)
- \* Default ponds are level ponds (Hunke et al.)
- \* Mushy-layer freezing point.

$$T_f = SSS / (-18.48 + 0.01848 * SSS) \text{ (Assur, 1958)}$$

# CESM2 Control Runs

- \* Many fully-coupled control runs including new physics in all components.
- \* Latest is number 90 in the series.
- \* Issue as of 66: one of the first “kitchen sink” runs.

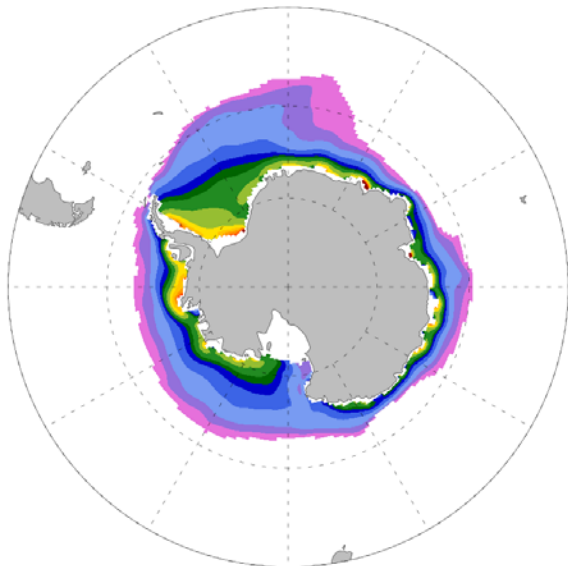
# The Good News: No More TMS! 😊

JFM Mean

b.e15.B1850.f09\_g16.pi\_control.all.66 Yrs 0081 - 0100    b.e15.B1850.f09\_g16.pi\_control.36 Yrs 0081 - 0100

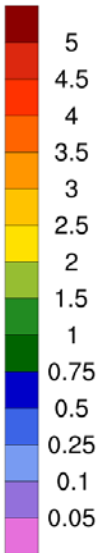
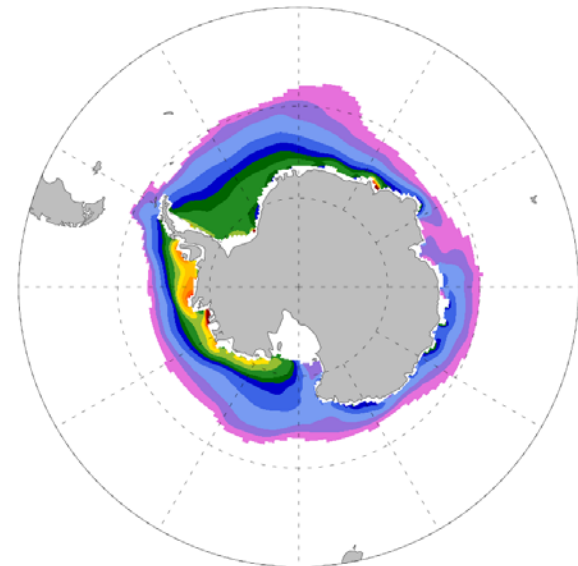
grid cell mean ice thickness

m



grid cell mean ice thickness

m



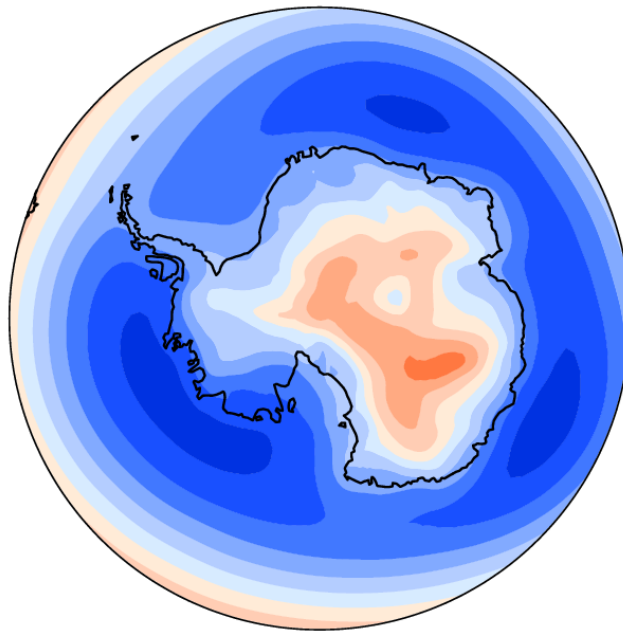
# Sea Level Pressure

## ANN

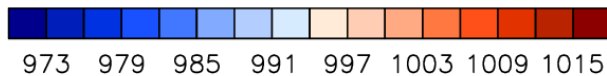
b.e15.B1850.f09\_g16.pi\_control.all.66 (yrs 75-99)    b.e15.B1850.f09\_g16.pi\_control.36 (yrs 75-99)

Sea-level pressure

millibars

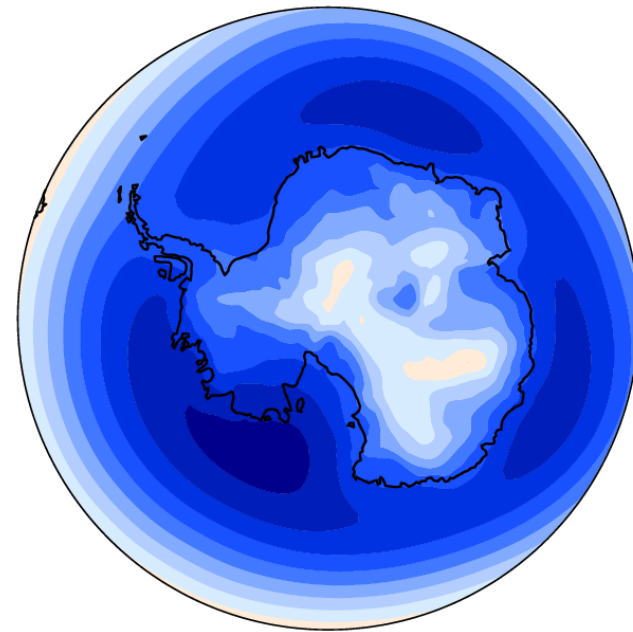


MEAN= 987.21    Min= 977.69    Max= 1004.58

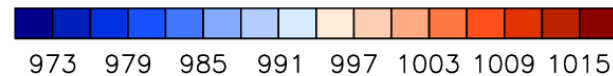


Sea-level pressure

millibars



MEAN= 982.25    Min= 971.64    Max= 997.05

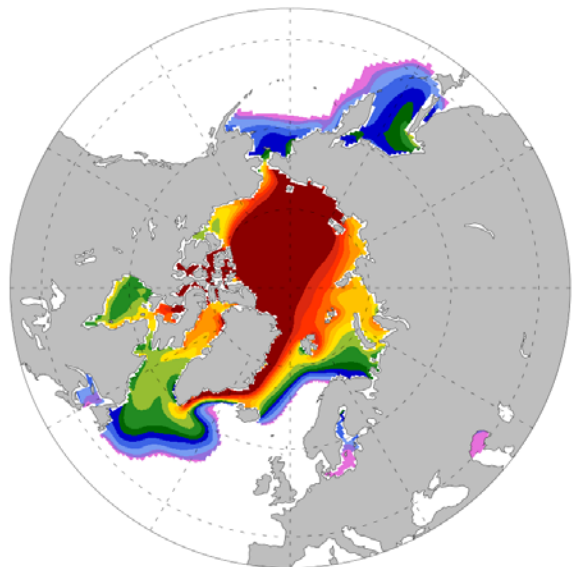


# The Bad News: No More TMS? ☹️

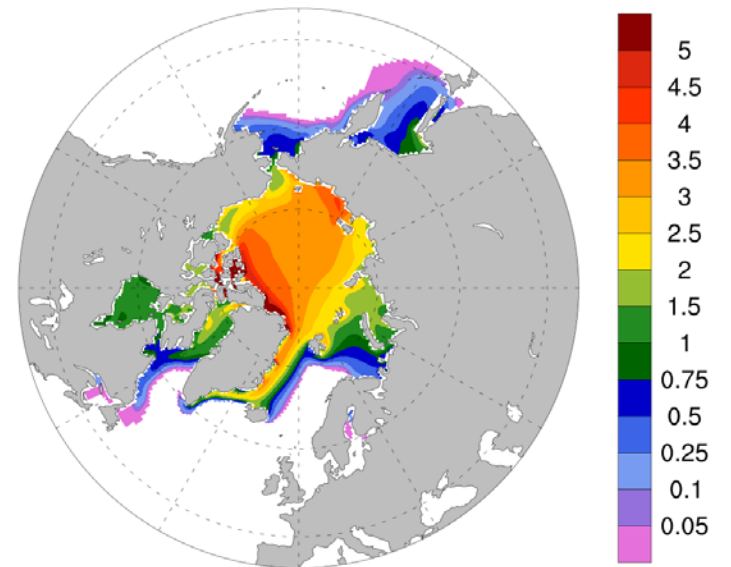
JFM Mean

b.e15.B1850.f09\_g16.pi\_control.all.66 Yrs 0081 - 0100    b.e15.B1850.f09\_g16.pi\_control.36 Yrs 0081 - 0100

grid cell mean ice thickness    m



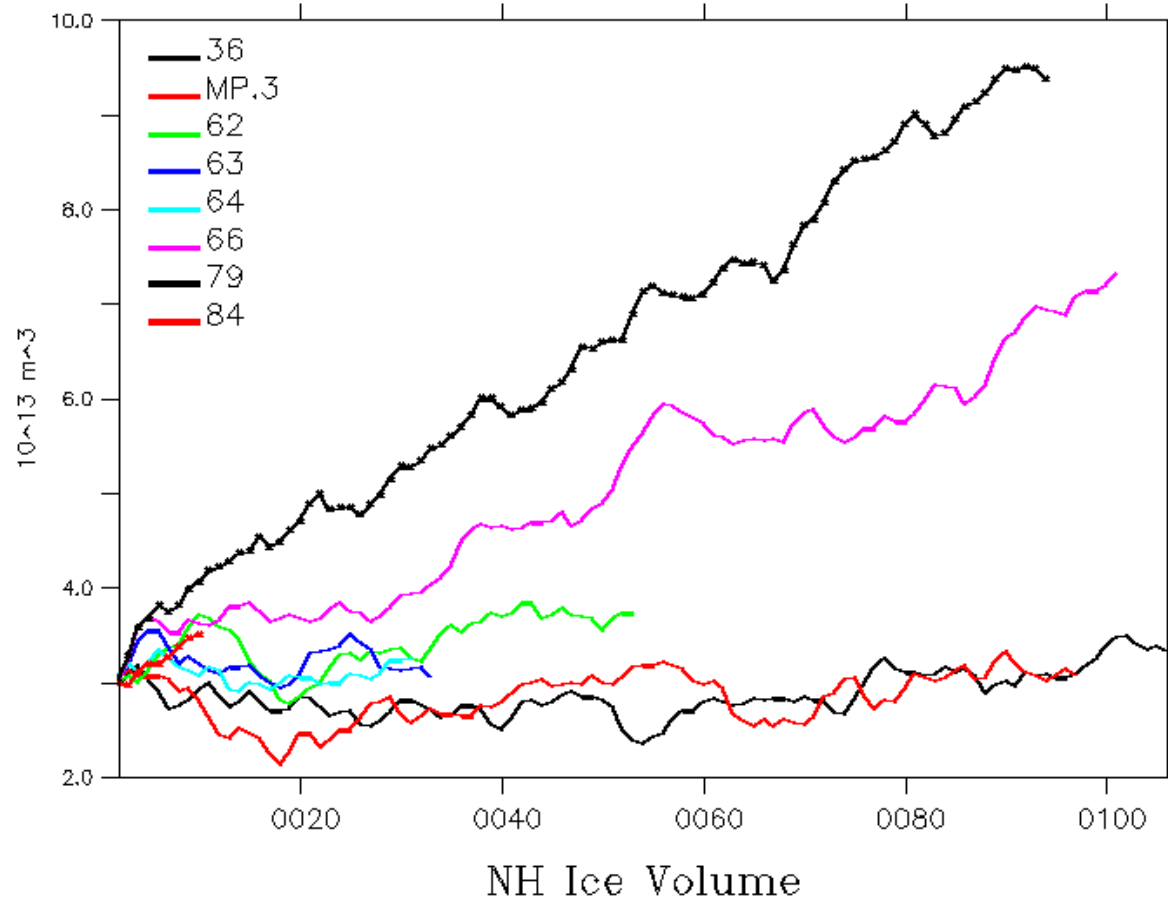
grid cell mean ice thickness    m



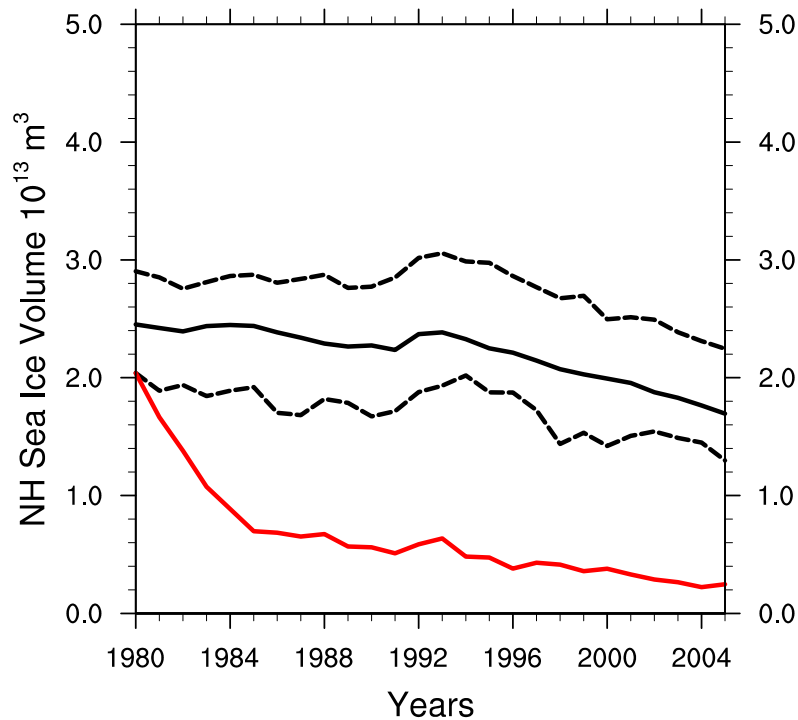
# Arctic Ice Volume

X : 0.5 to 320.5  
Y : 272.5 to 384.5  
CALENDAR: NOLEAP

FERRET Ver. 8.96  
NOAA/FHRL TMAP  
17-JUN-2016 10:44:01



# The Good News: Tuning. 😊



$$R_{snw\_nm} = R_{snw\_nonmelt} - R_{snw} * R_{snw\_sig}$$

$$R_{snw} = -1.5$$



# Tuning with 66

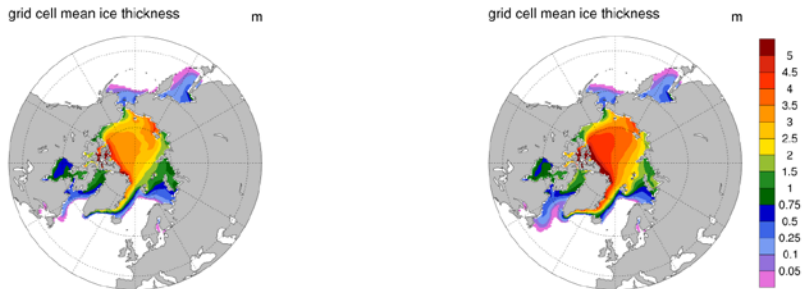
$R_{snw} = 1.5$  (1.75)

$dT_{mlt} = 1.5$  (1.0)

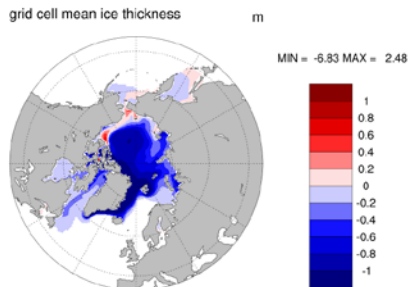
$rsnw_{melt} = 1500$  (1000)

ANN Mean

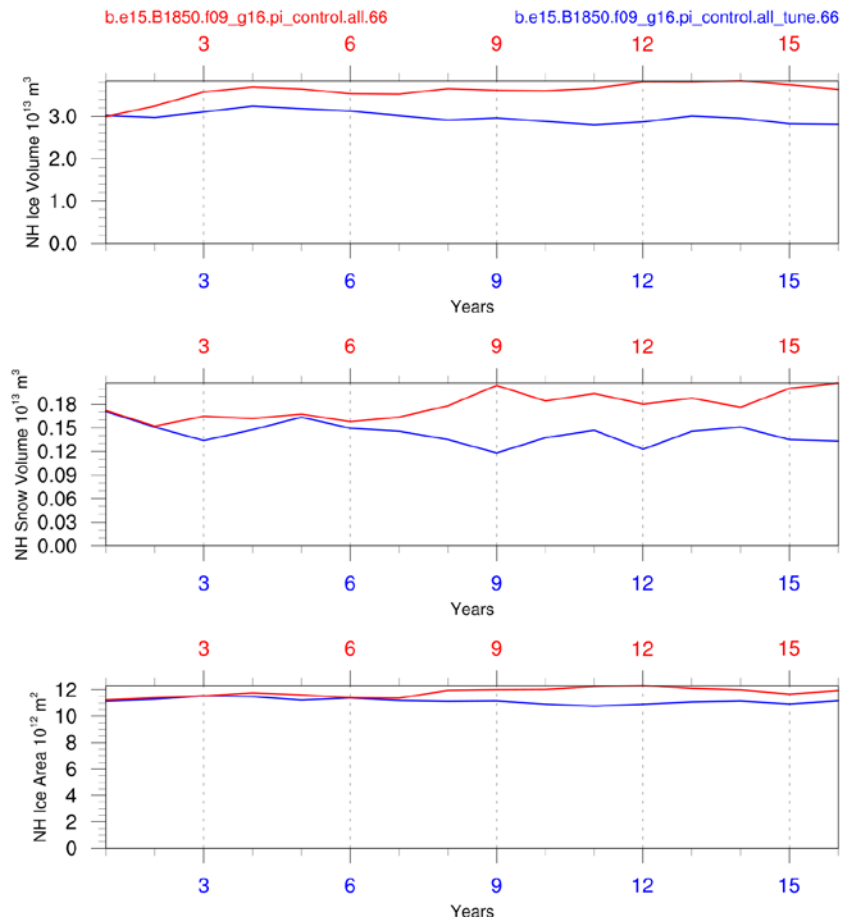
b.e15.B1850.f09\_g16.pi\_control.all\_tune.66 Yrs 0007 - 0016    b.e15.B1850.f09\_g16.pi\_control.all.66 Yrs 0007 - 0016



b.e15.B1850.f09\_g16.pi\_control.all\_tune.66 - b.e15.B1850.f09\_g16.pi\_control.all.66



ANN Mean b.e15.B1850.f09\_g16.pi\_control.all\_tune.66-b.e15.B1850.f09\_g16.pi\_control.all.66



# Summary

- \* Very close to expected CESM2 overall configuration
- \* Improvement in SH sea ice with removal of TMS, but degraded NH simulation for reasons to be determined.
- \* Tuning may help somewhat.
- \* Water isotopes ( $\text{H}_2^{16}\text{O}$ ,  $\text{H}_2^{18}\text{O}$ , HDO).

# CESM2 Timeline

July 1<sup>st</sup>: Science configurations  
“finalized”.

Sep 1<sup>st</sup>: Science code freeze.

Sep to Nov: Tuning and bug fixes.

Dec 31<sup>st</sup>: CESM2 Release

# Questions?



Photo credit:  
Chris  
Polashenski