

# High-resolution Coupled Ocean Results

- CCSM3\_hr: POP(x0.1) + CSIM(x0.1) + CAM(T85) -



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# Objectives

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- \* In "Kyosei project", we have developed a high resolution eddy-resolving ocean and sea ice models, which can calculate appropriately western boundary current such as Kuroshio, Gulf stream and mixing of meso scale eddy.
- \* How does the improvement of meridional heat transport, etc. affect the interaction between ocean and atmosphere ?

# Model description and Optimization

Base: *CCSM3* (vector6 version)

Ocean Model :  
**POP1**

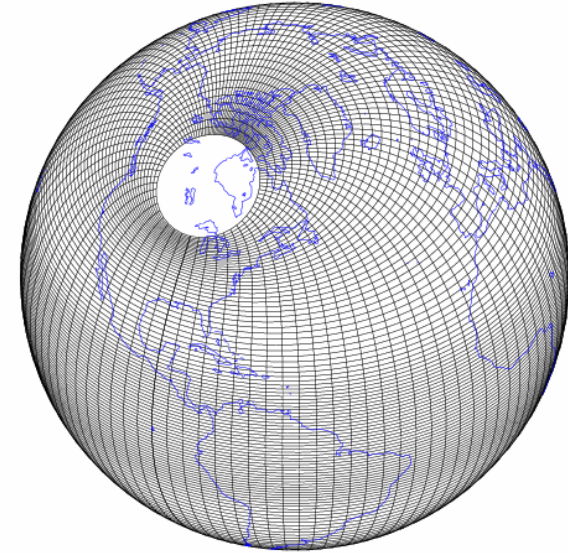
0.1deg dipole grid

Atmospheric Model : **CAM3**  
T85 (L26)

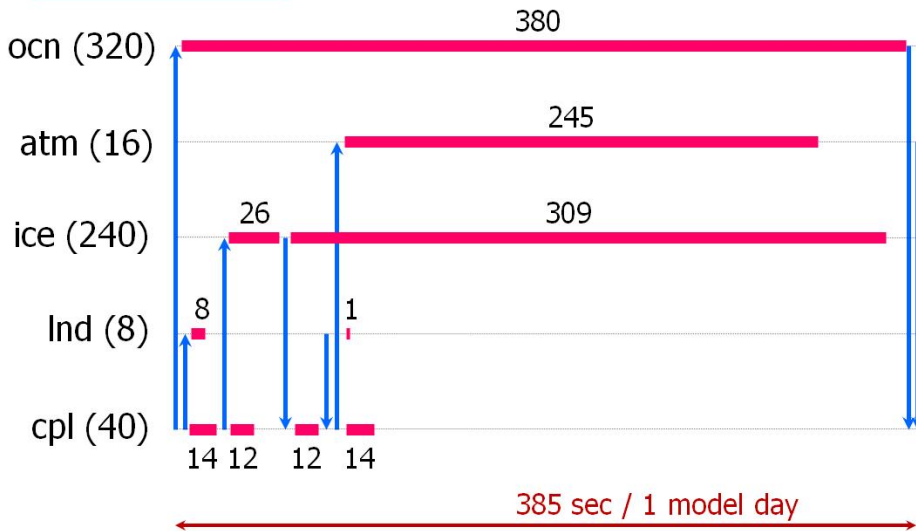
Sea Ice Model : **CSIM4**

0.1deg dipole grid, Runs on OCN grid

Land Surface model : **CLM2**  
T85 (L26) ,Runs on ATM grid



## Earth Simulator



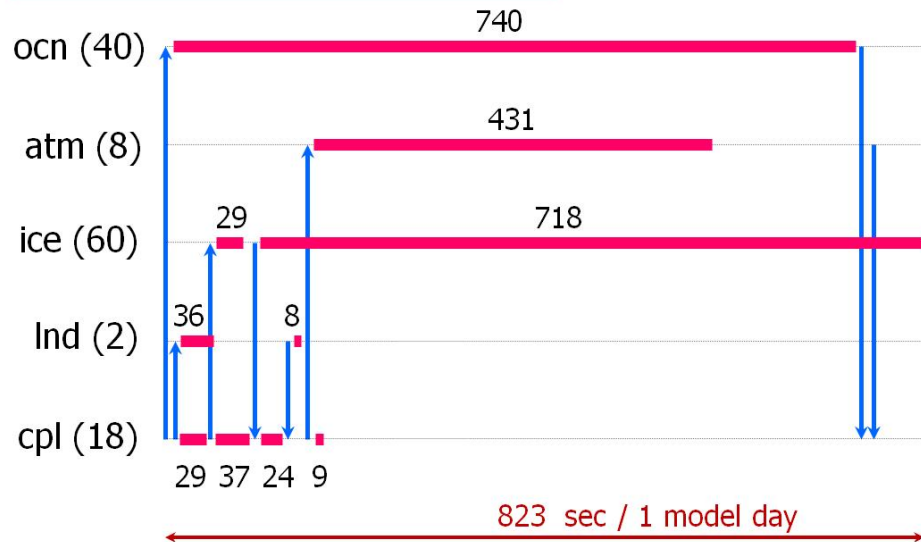
POP:

440 fullsteps/day

CSIM:

thermodynamics timestep = 360 sec,  
dynamics timestep = 120 sec.

## CRIEPI SX-8 (max. limit 16 node)



POP:

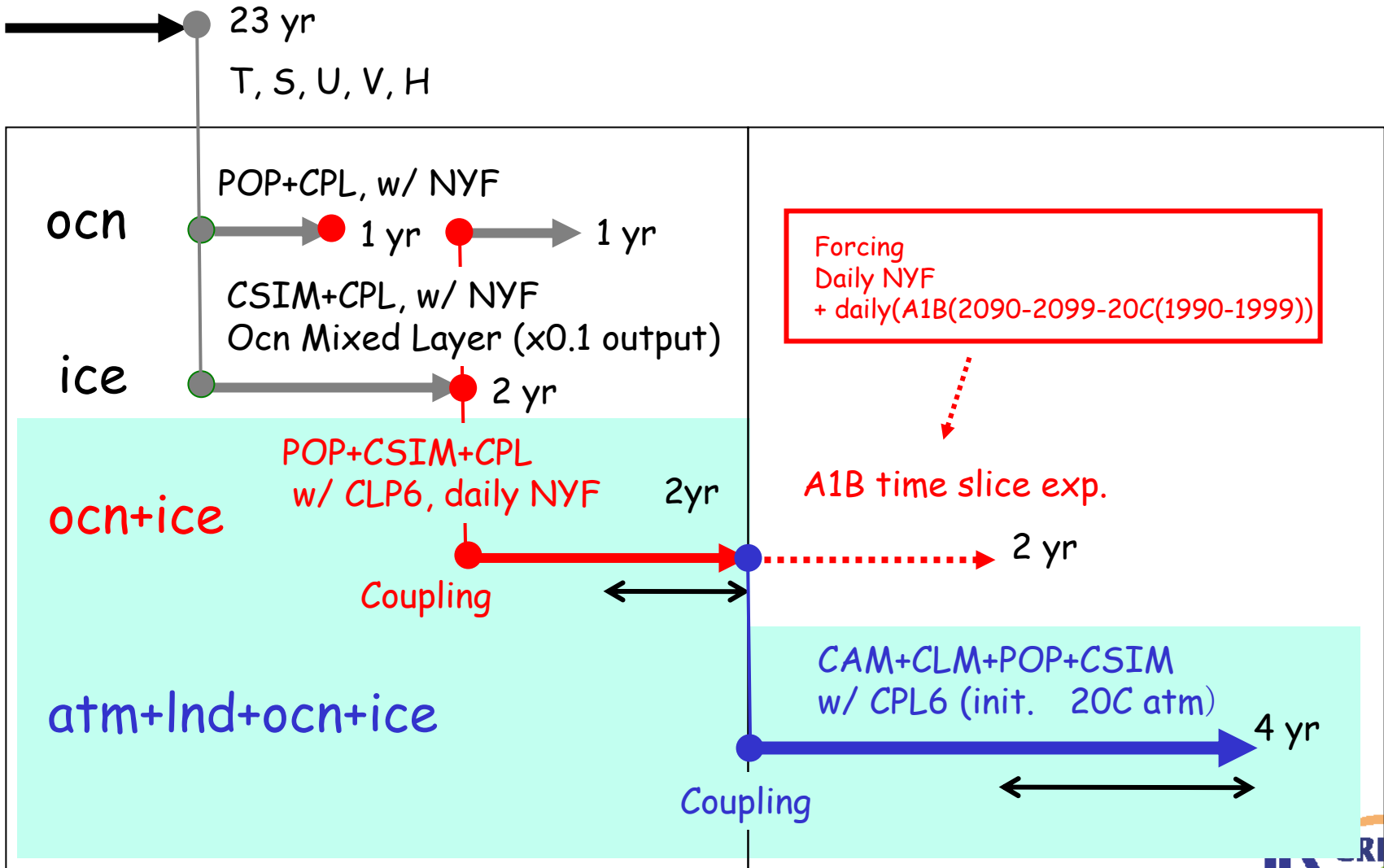
220 fullsteps/day

CSIM:

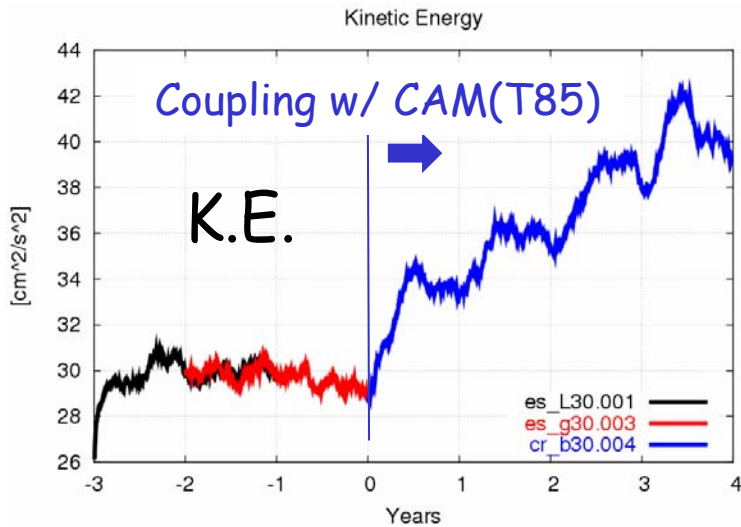
thermodynamics timestep = 200 sec,  
dynamics timestep = 100 sec.

# Model Coupling Procedure

Best case of stand alone POPx0.1 w/ monthly climate (NCEP)



# Drift of CCSM3\_hr after Coupling

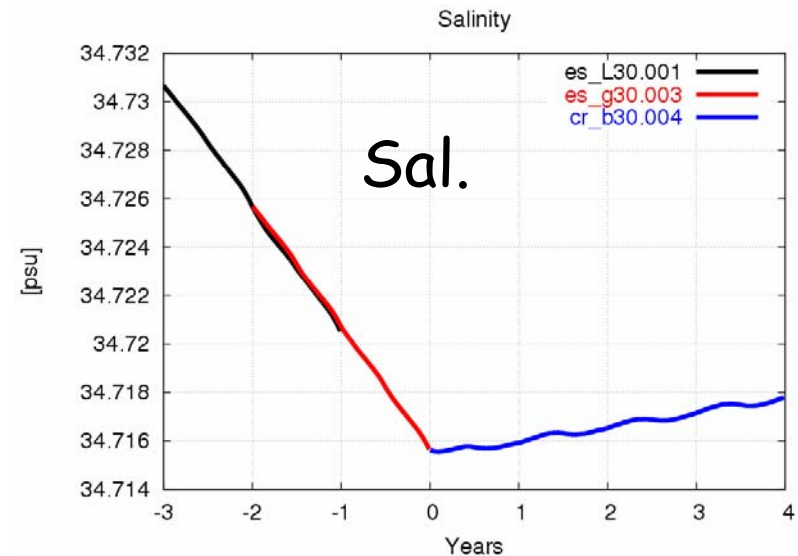
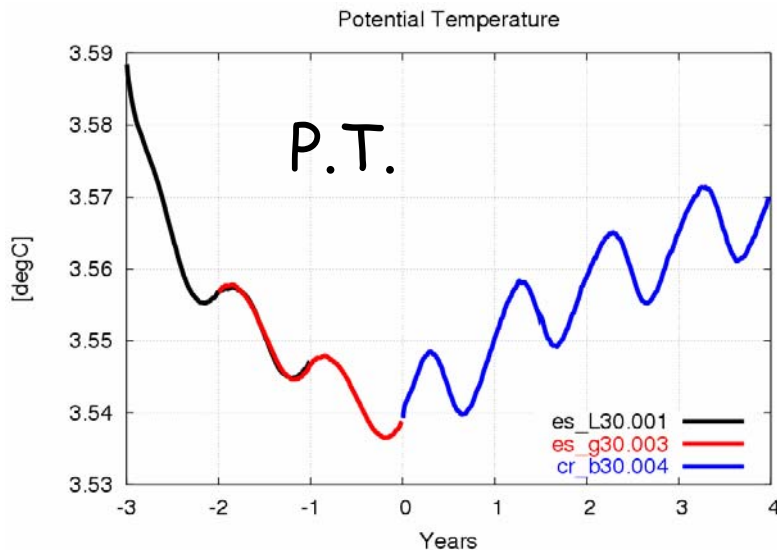


- POP(x0.1)  
NYF

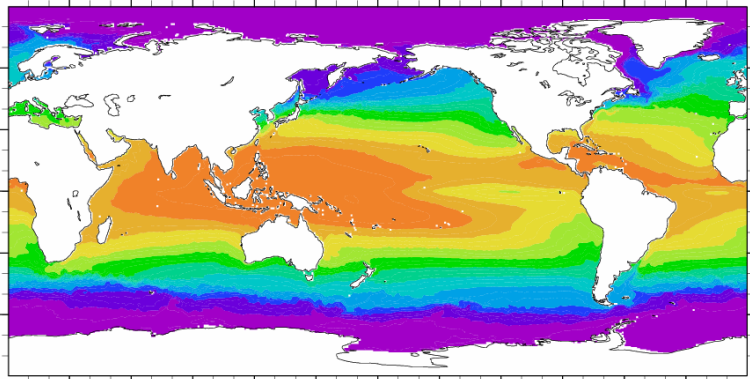
w/

- POP(x0.1)+CSIM(x0.1) w/ NYF

- CCSM3\_hr  
POP(x0.1)+CSIM(x0.1)+CAM(T85)



es\_g30.003.pop.h.0002-ann.TEMP 0.5X0.5 GL.nc degC

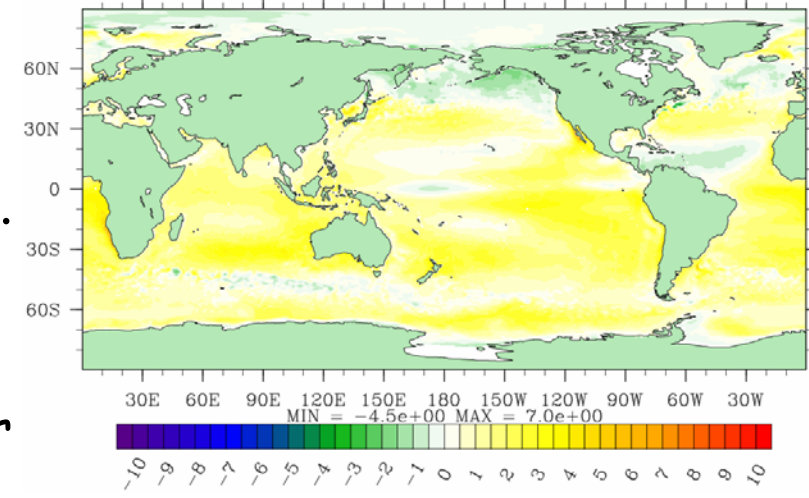


POP  
+CSIM

# Surface Temperature (ann)

Diff.

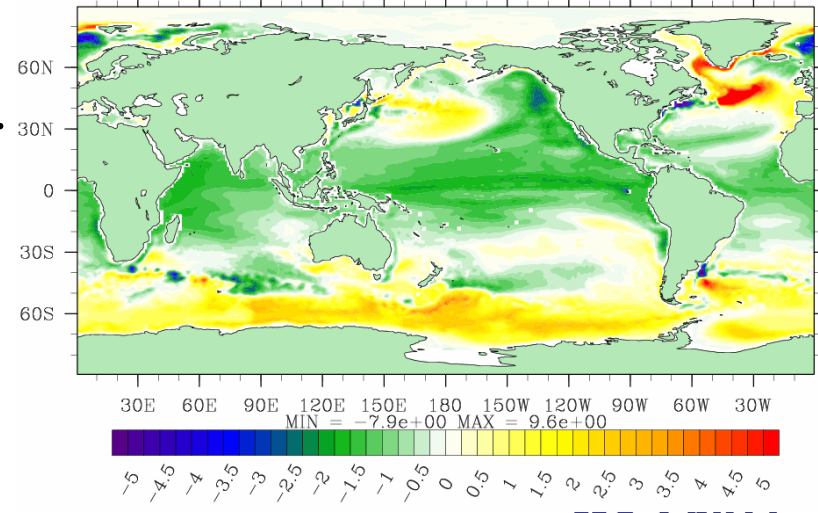
cr\_b30.004.pop.h-ann.TEMP 0.5X0.5 GL.nc



CCSM3\_hr

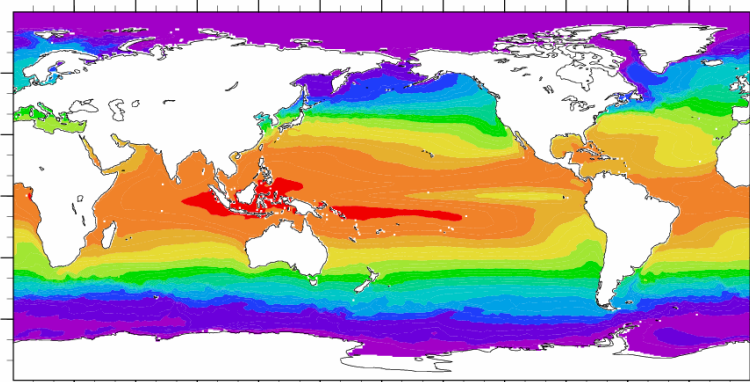
Diff.

cr\_b30.004.pop.h-ann.TEMP 1X1 GL.nc

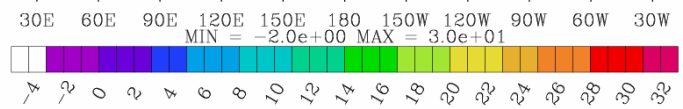
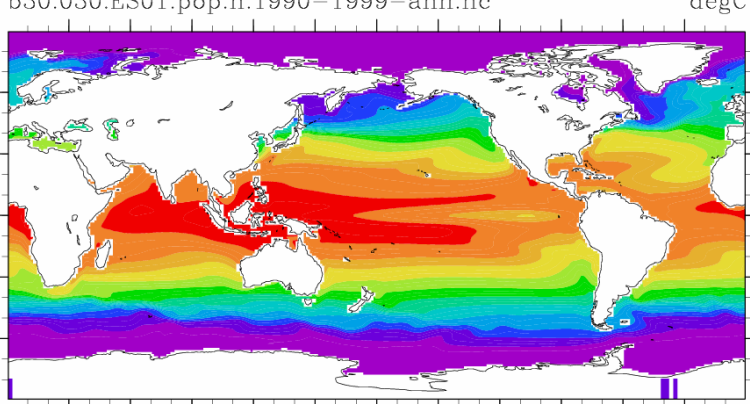


CCSM3

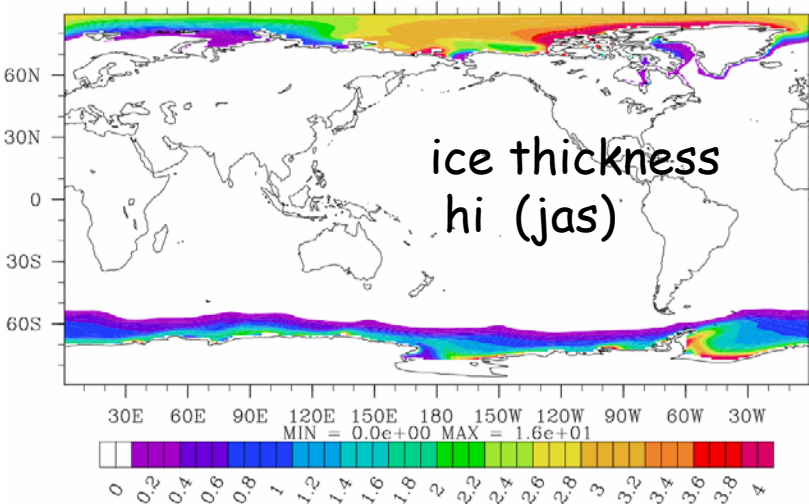
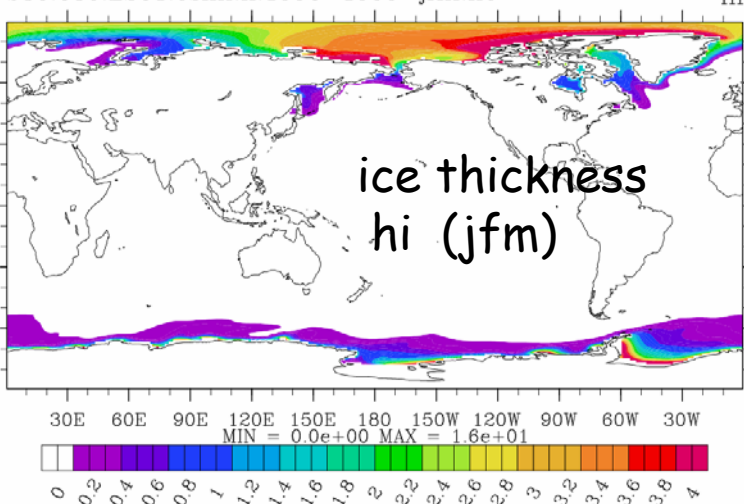
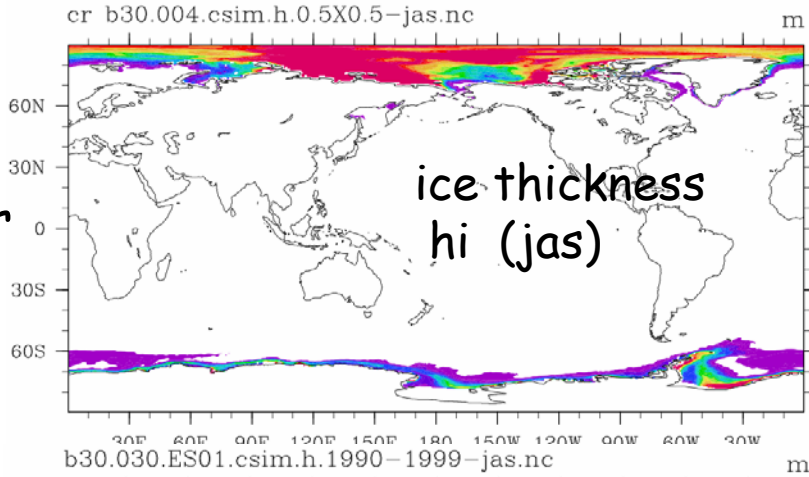
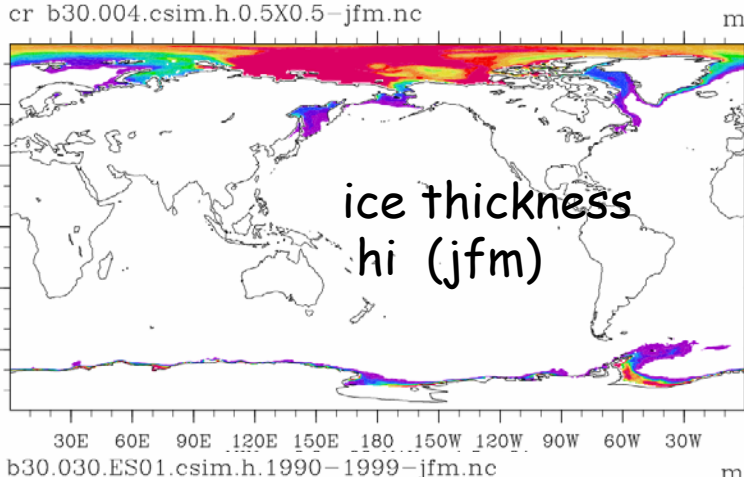
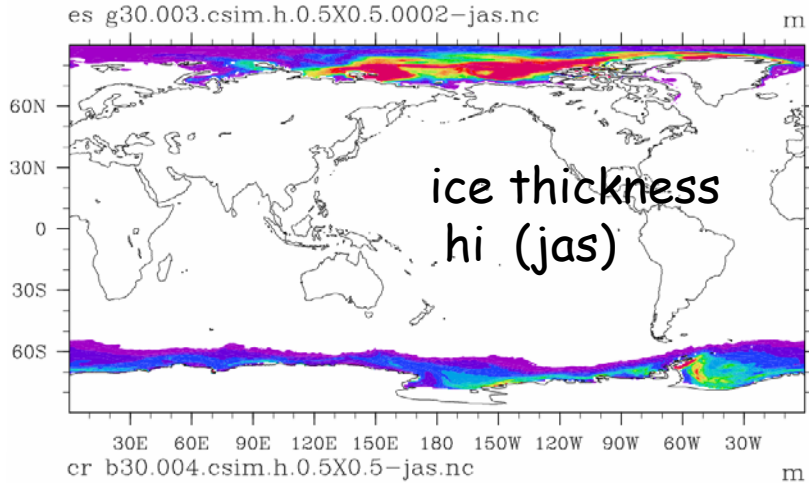
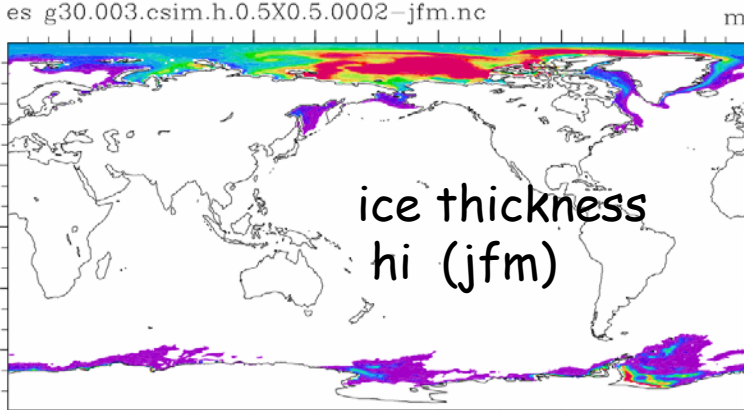
cr\_b30.004.pop.h-ann.TEMP 0.5X0.5 GL.nc degC



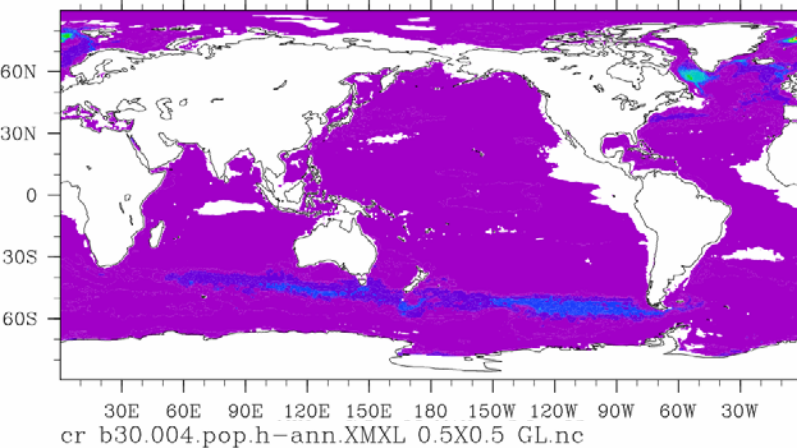
b30.030.ES01.pop.h.1990-1999-ann.nc degC







es\_g30.003.pop.h.0002-ann.XML 0.5X0.5 GL.nc

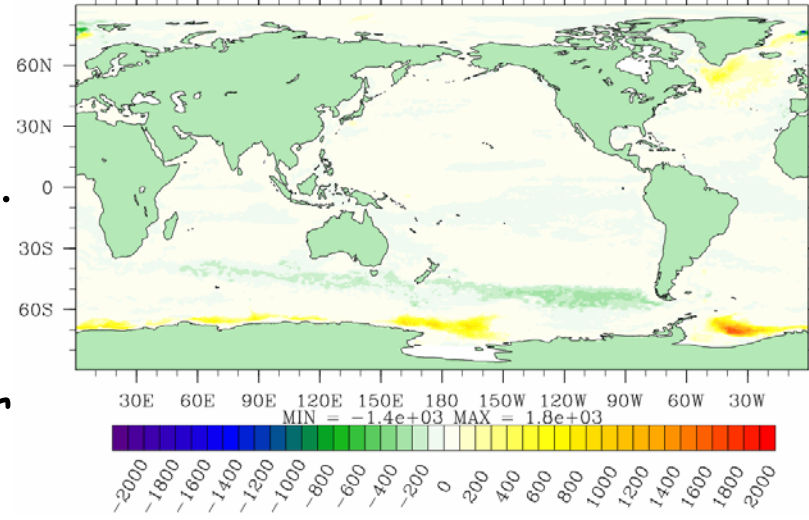


POP  
+CSIM

# Max. Mixing Layer (ann)

Diff.

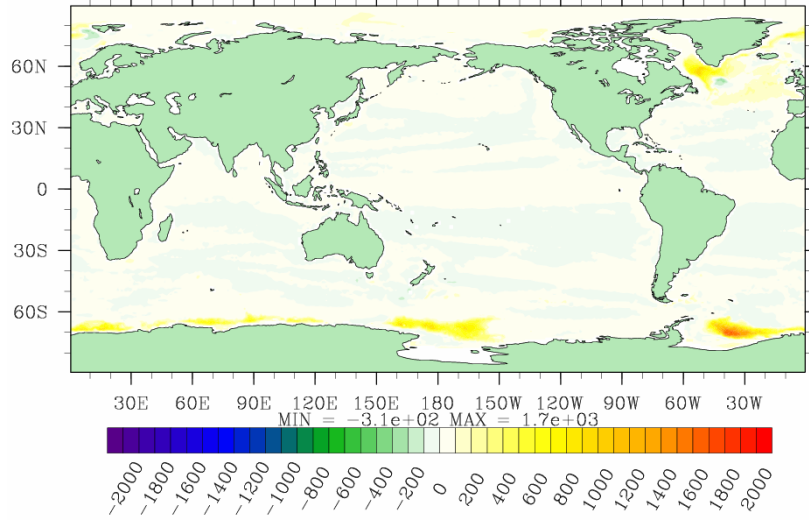
cr\_b30.004.pop.h-ann.XML 0.5X0.5 GL.nc



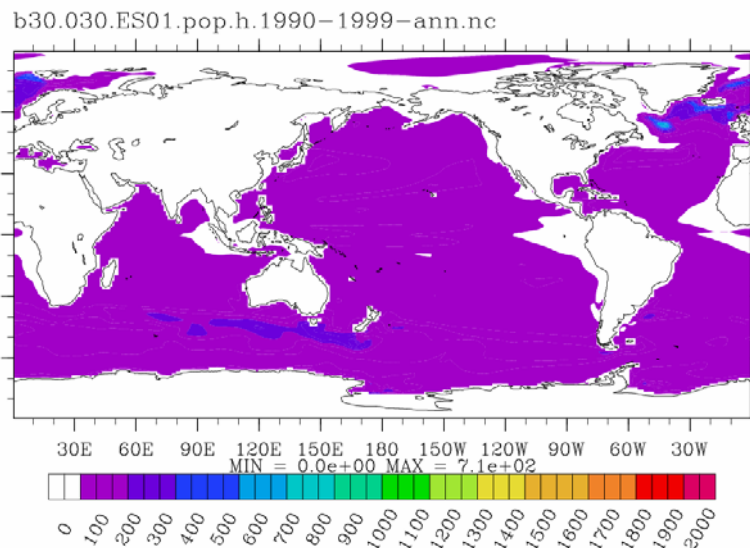
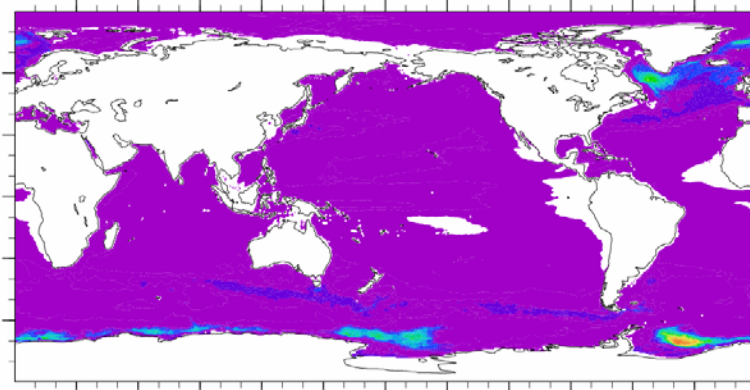
CCSM3\_hr

Diff.

cr\_b30.004.pop.h-ann.XML 1X1 GL.nc

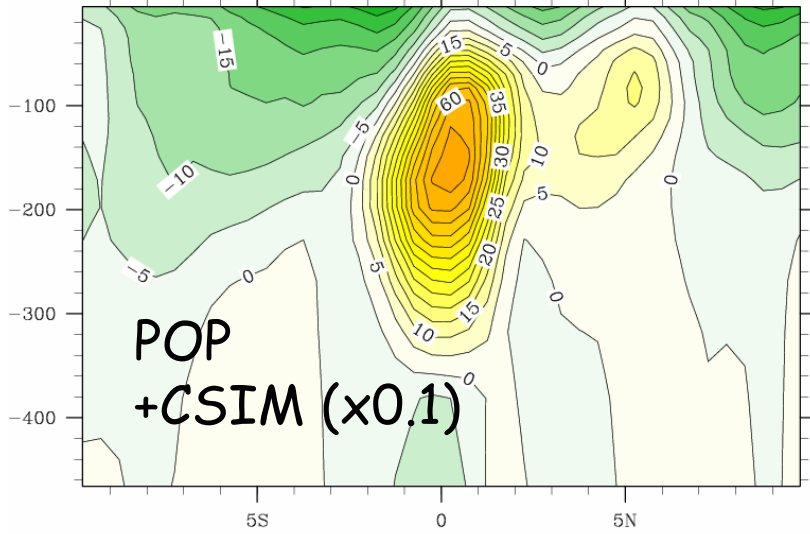


CCSM3

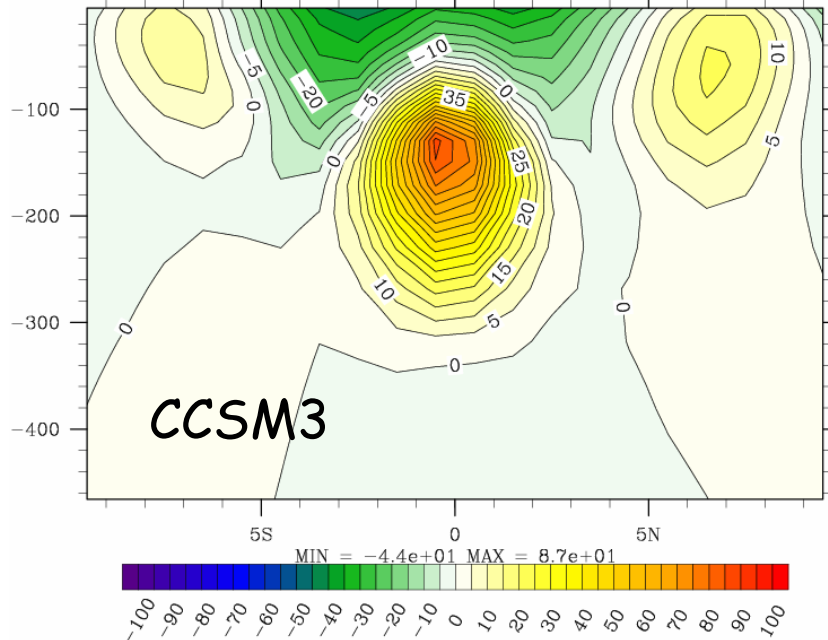




es g30.003.pop.h.0002-ann.UVEL 0.5X0.5



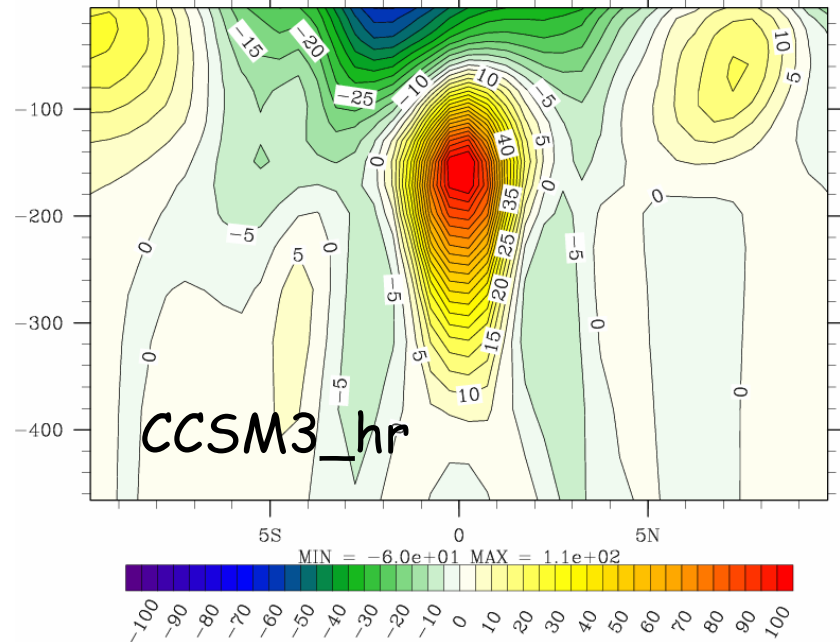
b30.030.ES01.pop.h.1990-1999



# Equatorial Under Current (ann)

Velocity U @205E

cr b30.004.pop.h-ann.UVEL 0.5X0.5





# Summary

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- \* 4 years integration is too short and still transitional. (kinetic energy, temperature and salinity is increasing)
- \* Bias of SST is similar to the medium resolution CCSM3.
- \* Sea ice becomes thicker in Arctic, on the contrary, thin in Antarctic.
- \* Deep water formation is more clear in CCSM3\_hr.
- \* Eq. Under current is stronger in CCSM3\_hr.
- \* Precipitation in JJA is similar, much rain in western Eq. Pacific in CCSM3\_hr.

Thank You

