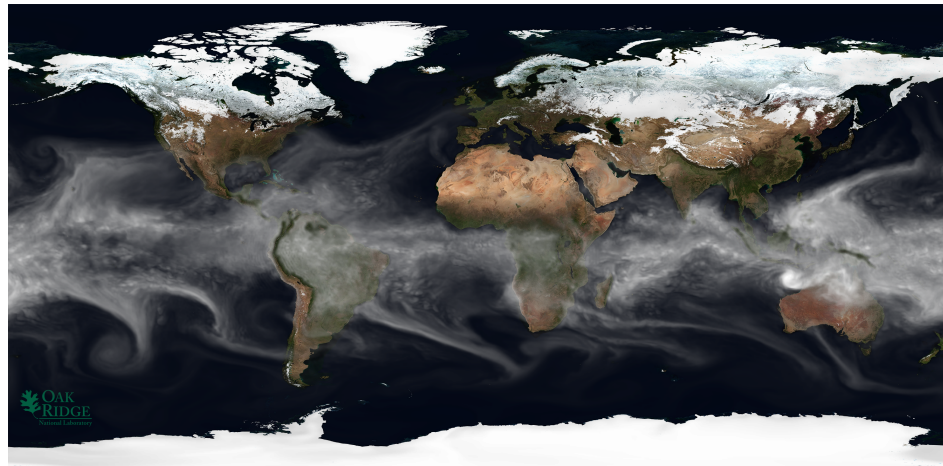


# Mean state and global characteristics of the T341 spectral Community Atmosphere Model

Presented by Kate Evans, ORNL

Collaborators on T341 include: D.C. Bader, G. Bisht, J. Caron, J.J. Hack, S. Mahajan, M.E. Maltrud, J.L. McClean, R. Neale, M.A. Taylor, J. Truesdale, M. Vertenstein, P.H. Worley and invaluable assistance from the CESM model working groups!



Thanks for support from DOE BER through: “Ultra High Resolution Global Climate Simulation to Explore and Quantify Predictive Skill for Climate Means, Variability and Extremes,” Project website: <http://highres-dev.ornl.gov/>

# Efforts to configure and run the high-resolution CESM using T341

- **Fully coupled CESM:**
  - T341 atm, FV  $\frac{1}{4}^{\circ}$  land,  $1/10^{\circ}$  ocean and sea ice
  - Using new ocean subcycling for stability
  - 3 years complete, currently running more on Titan
- **Preind T341 with forced HadSST, 12 yrs complete**
- **1975-2005 forced HadSST (AMIP), 8 yrs complete**
- **Creating optimal initial datasets.**
- **Data. Lots of Data.**
- **Jaguar -> xk6: FAMIP 2.5 SYPD**

# T85 base production runs

- **CAM4 AMIP simulation to compare to FV, SE dycores**
- **50 year preindustrial coupled control**
  - Start from yr 863 ~1° FVCCSM4
  - Start from yr 863 gx1v6 ~1° ocean and ice fields
  - More years to come...
- **Ensemble of 30 year coupled present day simulations covering 1975-2005**
  - Initial state: FV CCSM4 1970 ocean, ice, land
- **Project partners are evaluating simulations**
- **Archive robust output fields**

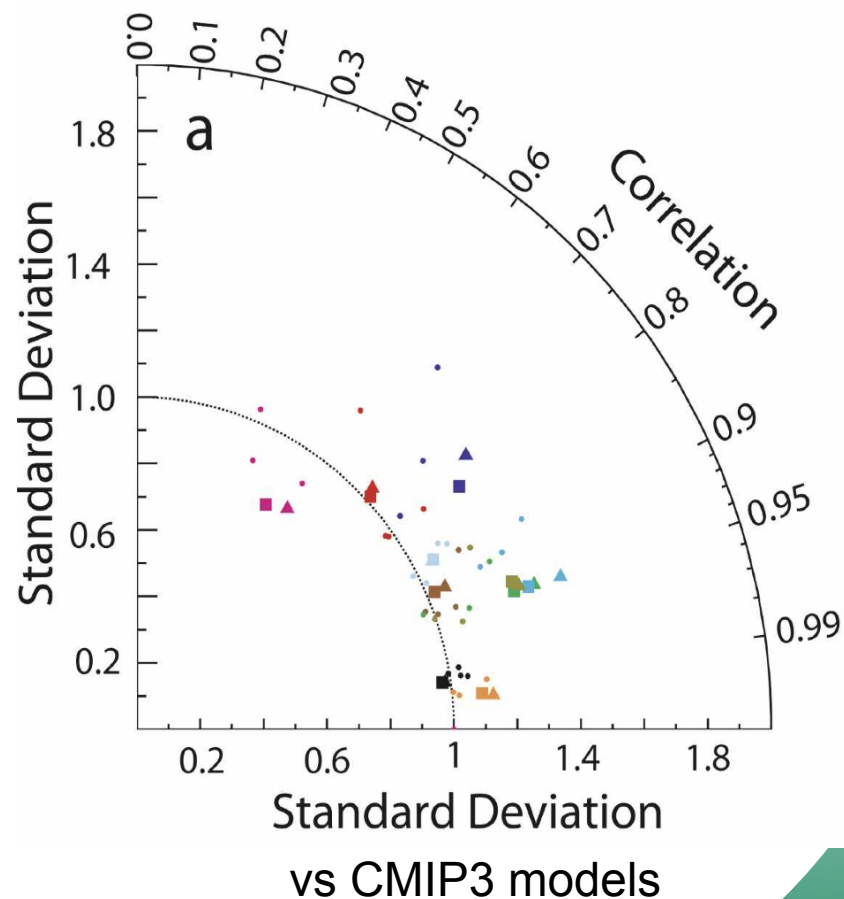
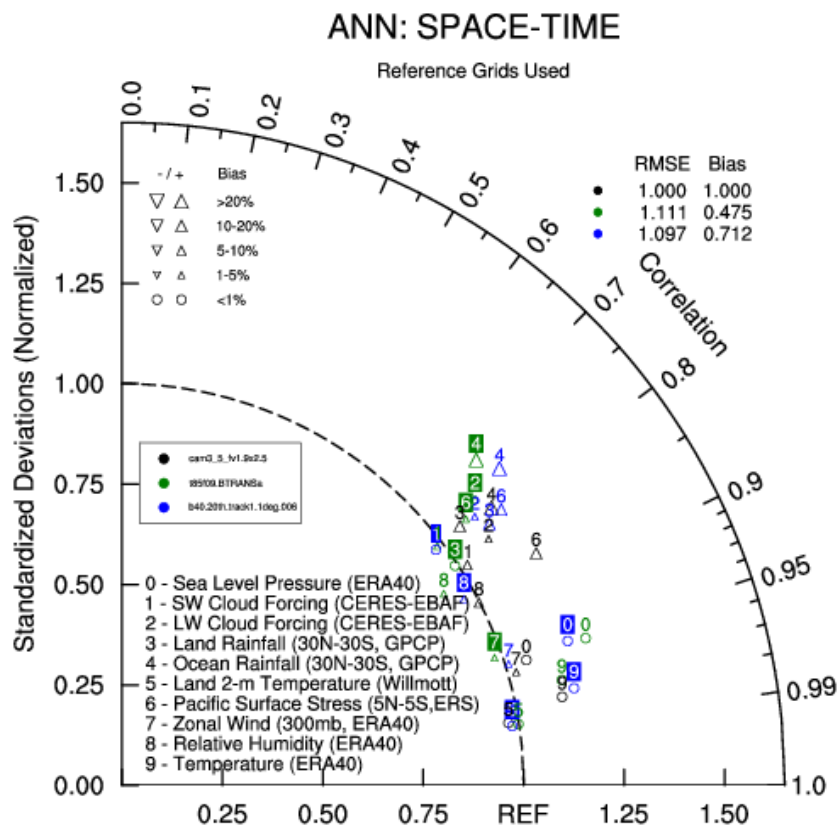
# Attributes of CAM4 T85 coupled run:

- **Improvements moving to CAM4 from CAM3 benefited T85 as well as FV**
- **Better midlatitude LWCF, SWCF**
- **Overestimated wind stress compared to obs and FV, as with CAM3**
- **But overall, CAM4 dycores produce similar results**
  - **Can't tune away issues with moisture and clouds**
  - **Double ITCZ, precip biases**

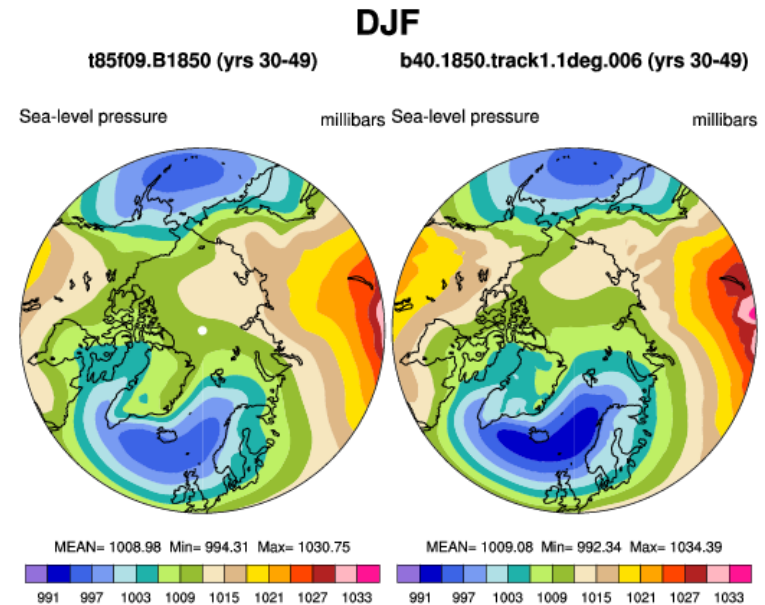
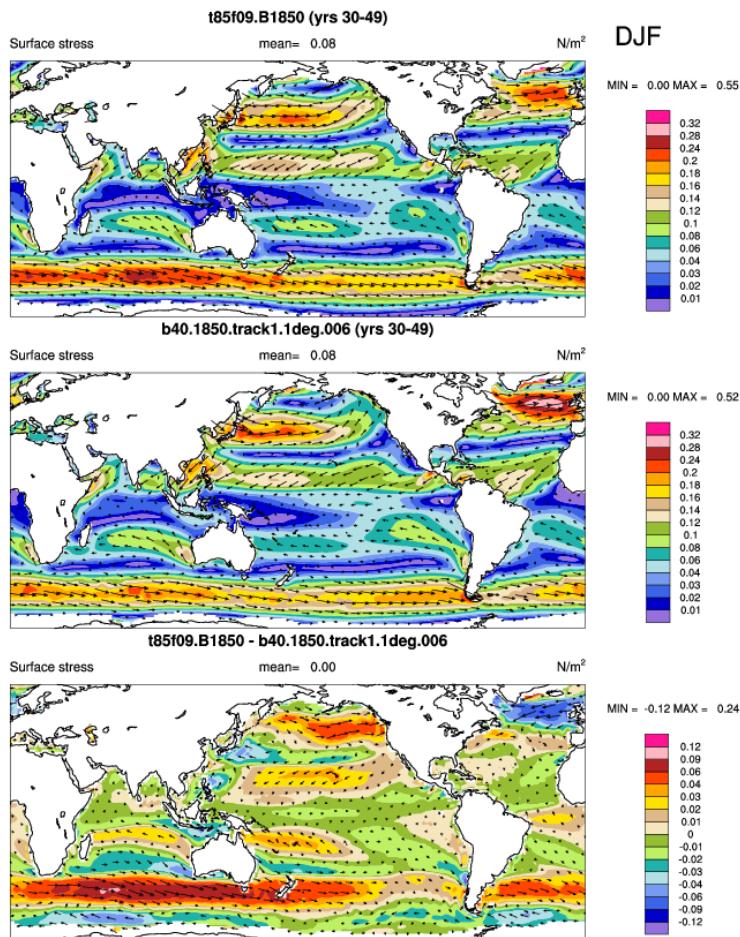
# Taylor diagram of global annual means CAM4 and CAM3 FV/T85

T85/FV1 CAM4 TRANS

T85/FV1 CAM3 1990 control

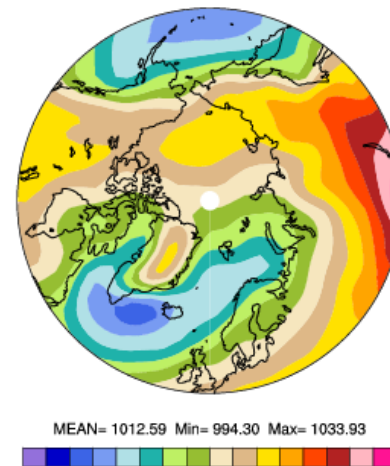


# T85 coupled preind wind stress bias does not feed back to significant SLP/ice errors



**185f09.B1850 - b40.1850.track1.1deg.006**

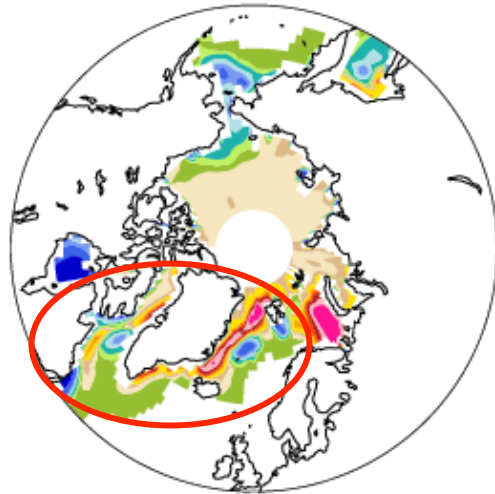
Sea-level pressure millibars



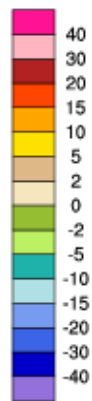
# Northern Hemisphere Sea Ice Concentration

FV CCSM4-SSM/I

Sea ice concentration %

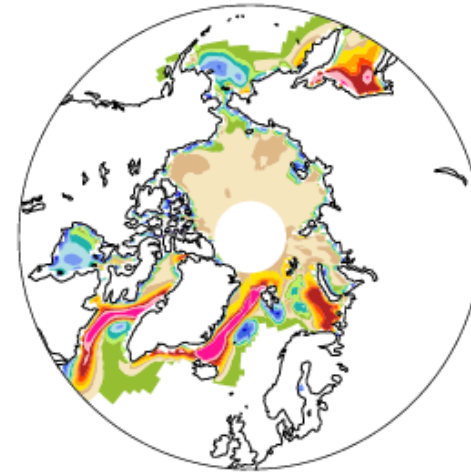


MIN = -93.56 MAX = 62.64

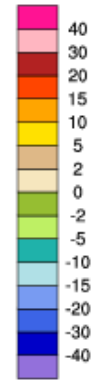


T85 CCSM4-SSM/I

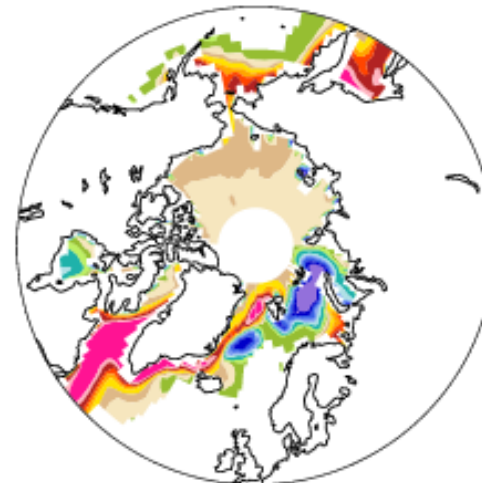
Sea ice concentration %



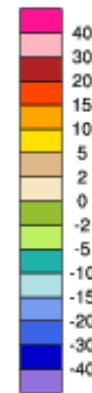
MIN = -91.00 MAX = 72.56



Sea ice concentration %



MIN = -91.46 MAX = 85.83



T85 CCSM3-SSM/

# T341 produces global energy balance for preindustrial data ocean configuration

- T85 1850 control run: 8 years (after ~30 years spin up while tuning)
- T341 1850 control run: 10 years (after a 10 year spin up while tuning)

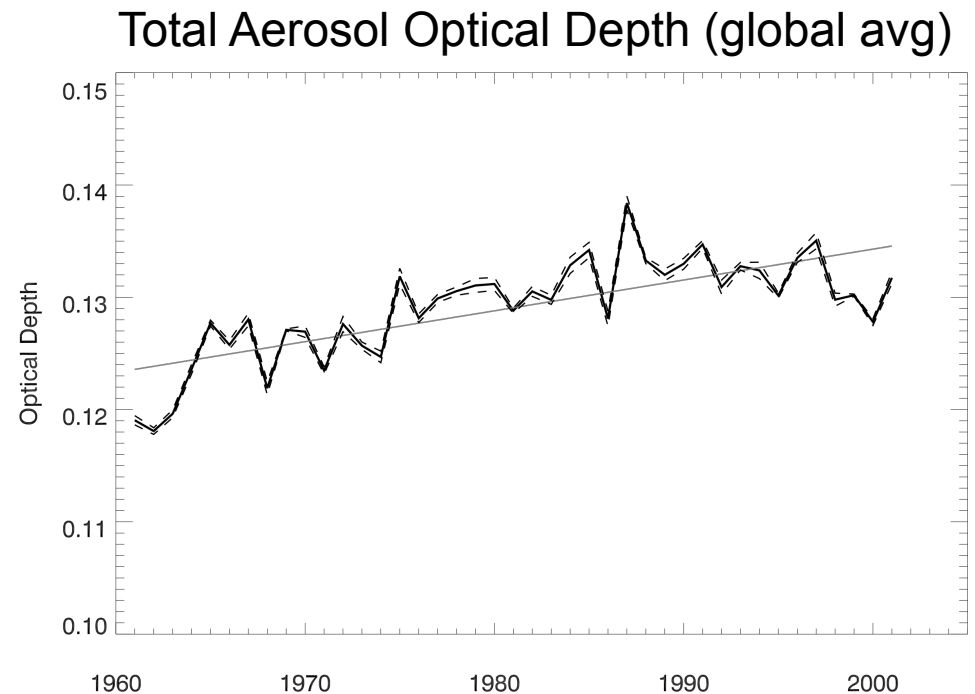
Global Annually Averaged Variables of Interest

Variable	T341	T85
RESTOM	-.215	-.296
FSNT	245.5	237.3
FLNT	245.8	237.6
TS (land)	280.7	281.0
CLDTOT	37.9	48.5
LWCF	20.7	27.8



# Generating a High Resolution Tropospheric Aerosols Dataset w/ Inter-annual Variability

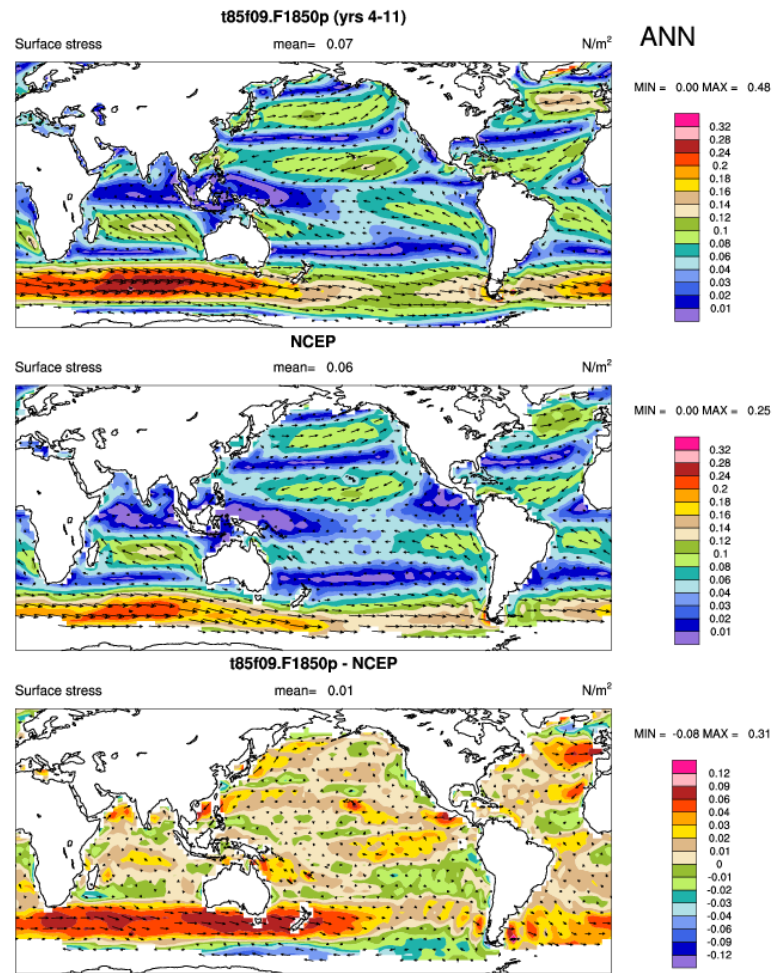
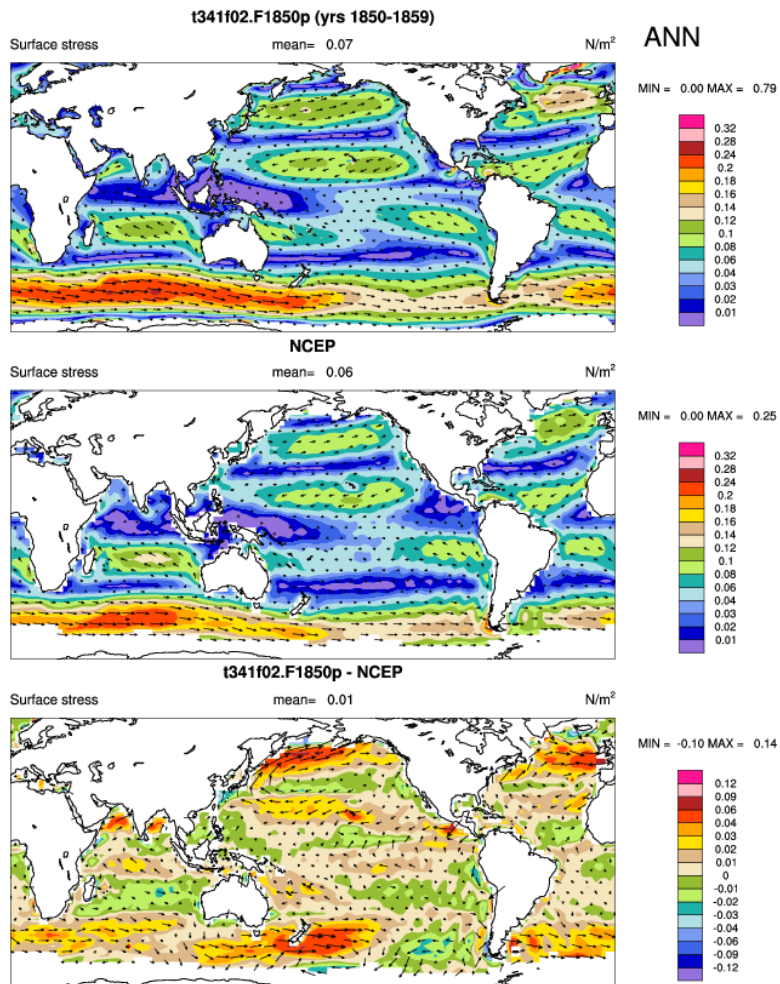
- **Studies show aerosol-induced inter-annual variability in regional climate, [e.g. Huang et al. 2009]**
- **AR5 Surface Emissions:**
  - Decadal temporal resolution
  - No inter-annual variability
- **Goal: Generate a high-resolution dataset monthly temporal resolution**
- **Study impacts of aerosol-induced variability in experiments using the new dataset**
- **Study role of thermodynamic feedbacks**



Aerosol Optical Depth in experiments performed with aerosol dataset generated from AR5+RETRO surface emissions

Full analysis in Mahajan et al (2012), J Climate, submitted.

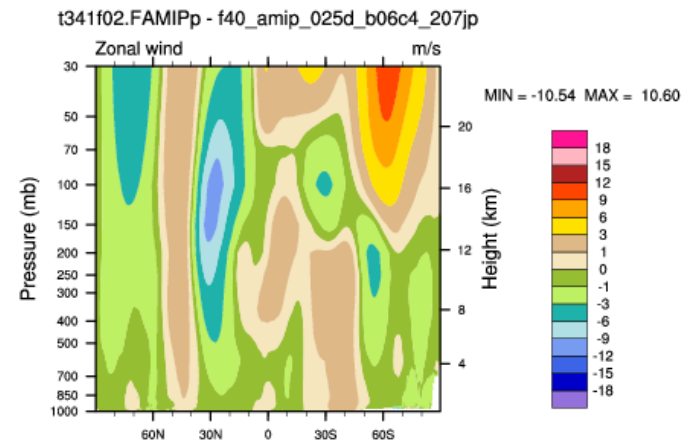
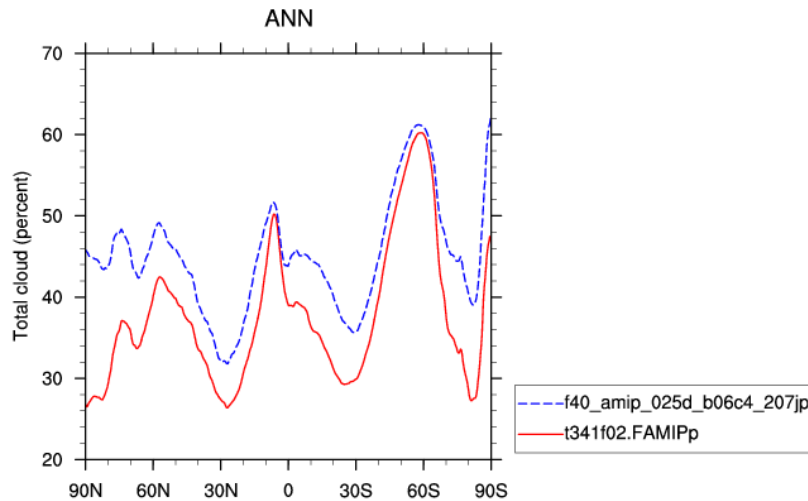
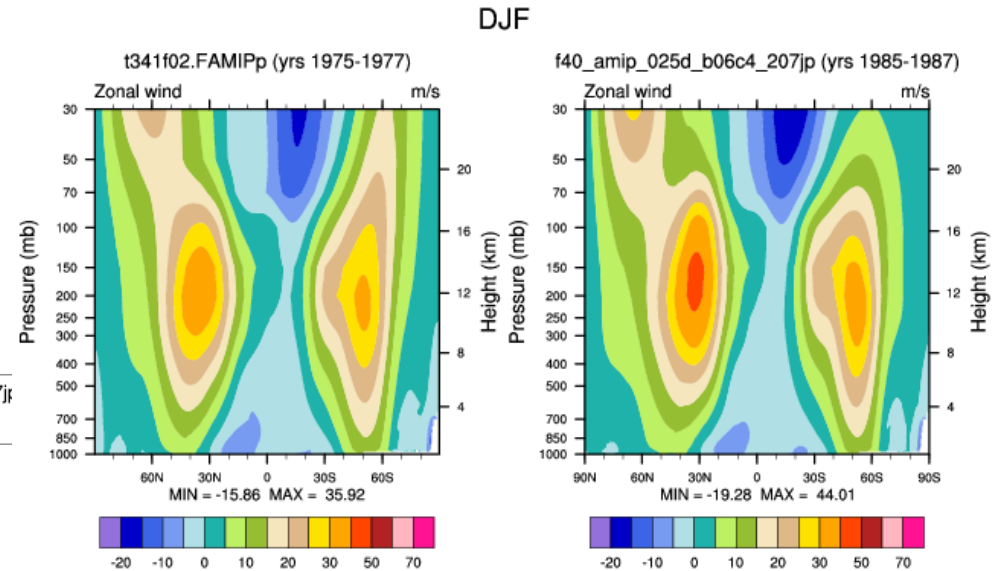
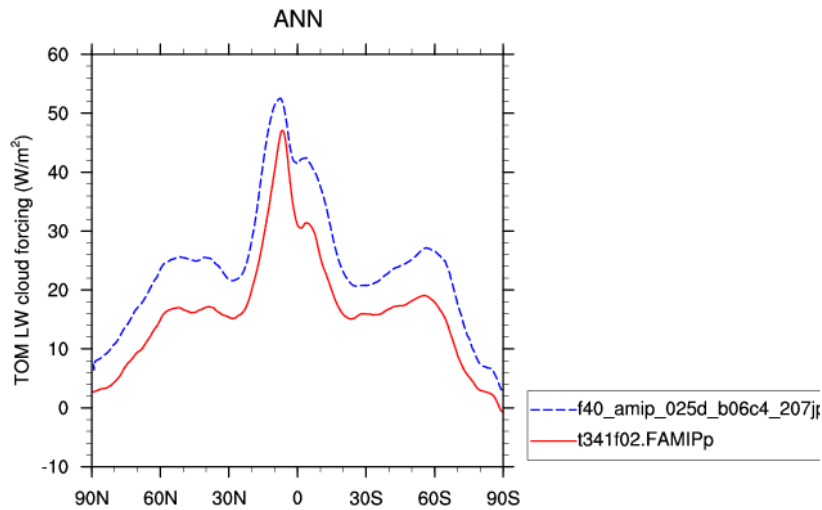
# T341 preindustrial control run



# T341 AMIP 1976-1980 complete

- **RESTOM ~1.4W (preind T341 is -0.22)**
- **Lower levels of cloud and precip than lower resolution AMIP and FV**
- **Reduced surface stress also seen with AMIP**
- **Polar NH sea level pressure too strong, but weaker across pole, as it should be**

# T341 FAMIP setup versus FV, 3 years



Most of extra clouds from high cloud

# High Resolution Preindustrial Coupled Run

- **1 year complete**
  - Biases seen with uncoupled run, such as too few clouds and precip, still present
  - Wind stress bias as with coupled T85
- **Uses new ocean and ice initial conditions**
- **Uses tuned preindustrial T341 parameters**

# Precip improvements?

