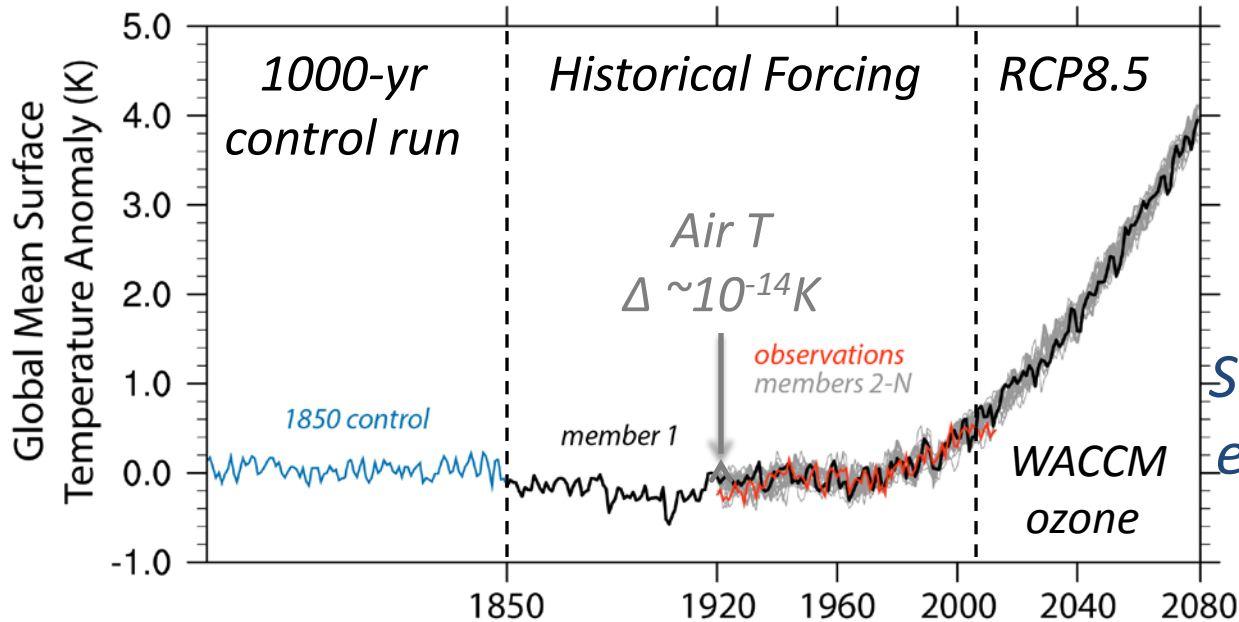


# CESM-CAM5 Large Ensemble Project



30 Runs  
1920-2080

*Same forcing  
Same initial conditions  
except round-off error  
to initial air temps*

Clara Deser and Jen Kay (leads)

Marika Holland, the CESM internal co-chairs, Adam Phillips, Andy Mai,  
Adrienne Middleton, Gary Strand, and many more in the CESM Community

*Kay et al. (BAMS, in preparation)*

# Top 10 CESM-CAM5 Large Ensemble Facts



1. Community project supported by CESM CSL resources
2. 1 degree CESM-CAM5 (CESM1\_1\_1, CMIP5 physics with diagnostic BGC)
3. LE Tag available in collections (cesm1\_1\_2\_LENS)
4. 1100+ year 1850 control, 30+ ensemble members
5. 1920-2080, Historical and RCP8.5 forcing, WACCM ozone (not SPARC as in CMIP5)
6. Ensemble created with round-off error in air temperature (pertlim)
7. Continuous daily and monthly output; 6-hourly output for 1990s, 2025-2034, 2070s
8. Archiving single variable time series, not history files
9. Each member takes ~3 weeks on Yellowstone. Run 3 at a time. 220 wall-clock days total!
10. Post-processed output 5.7 TB/member. 190 TB total!

- 25 ensemble members (1920-2080) done, hope to finish all 30 by early March
- All single-variable outputs and restarts on HPSS
- Select single-variable outputs on glade (/glade/p/cesm0005/CESM-CAM5-BGC-LE)

# Up-to-date information on the soon-to-go-public website

*(ask me for the password if you don't know it already)*

<http://www.cesm.ucar.edu/experiments/cesm1.1/LE/>

There is also an e-mail list for all future updates - Please sign yourself up at:

[http://mailman.cgd.ucar.edu/mailman/listinfo/cesmcam5\\_lrgens](http://mailman.cgd.ucar.edu/mailman/listinfo/cesmcam5_lrgens)

# BAMS paper to serve as official reference is currently being written

## CESM1(CAM5) LARGE ENSEMBLE COMMUNITY PROJECT

### Ongoing Project Descriptions

#### **BAMS overview paper**

Jen Kay (jenkay at ucar.edu), Clara Deser (cdeser at ucar.edu) and co-authors TBD

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"The CESM Large Ensemble Project: A Community Resource for Studying Climate Change in the Presence of Natural Climate Variability" Overview paper of the Large Ensemble intended for BAMS. This will serve as the "official" reference for this project. It will describe the motivation for such a project, discuss how the runs were configured, and highlight some preliminary results, with the intention of advertising the Large Ensemble to the broader climate community.

#### **Robustness of the SAM response to GHG and ozone forcing**

Clara Deser (cdeser at ucar.edu), Tingting Fan (tingting at ucar.edu) and Dave Schneider (dschneid at ucar.edu)

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We are interested in looking at the 3-dimensional structure of the extra-tropical southern hemisphere atmospheric circulation response to GHG and ozone forcing in each of the ensemble members, with a focus on the period of ozone depletion in recent decades.

#### **Variability and predictability of the North Atlantic**

Gokhan Danabasoglu (gokhan at ucar.edu), Steve Yeager (yeager at ucar.edu), Alicia Karspeck (aliciak at ucar.edu) and Laura Landrum (landrum at ucar.edu)

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We are interested in using the Large Ensemble and the Large Ensemble control to look at variability, variability mechanisms, predictability, and prediction in the North Atlantic with a focus on the Atlantic Meridional Overturning Circulation.

#### **Contrasting urban and rural heatwaves over the U.S.**

Keith Oleson (oleson at ucar.edu)

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I am interested in investigating the variability of heatwaves and extreme heat events over the U.S. for present-day and future climate with a focus on the differences between urban and rural areas. This project may become part of a larger collaboration with J.F. Lamarque and Claudia Tebaldi as part of the CGD Climate and Human Systems Project (CHSP) (still under discussion).

#### **Changing Polar Bear Sea Ice Habitats**

Marika Holland (mholland at ucar.edu), Steven Amstrup (Polar Bears International) and Jen Kay (jenkay at ucar.edu)

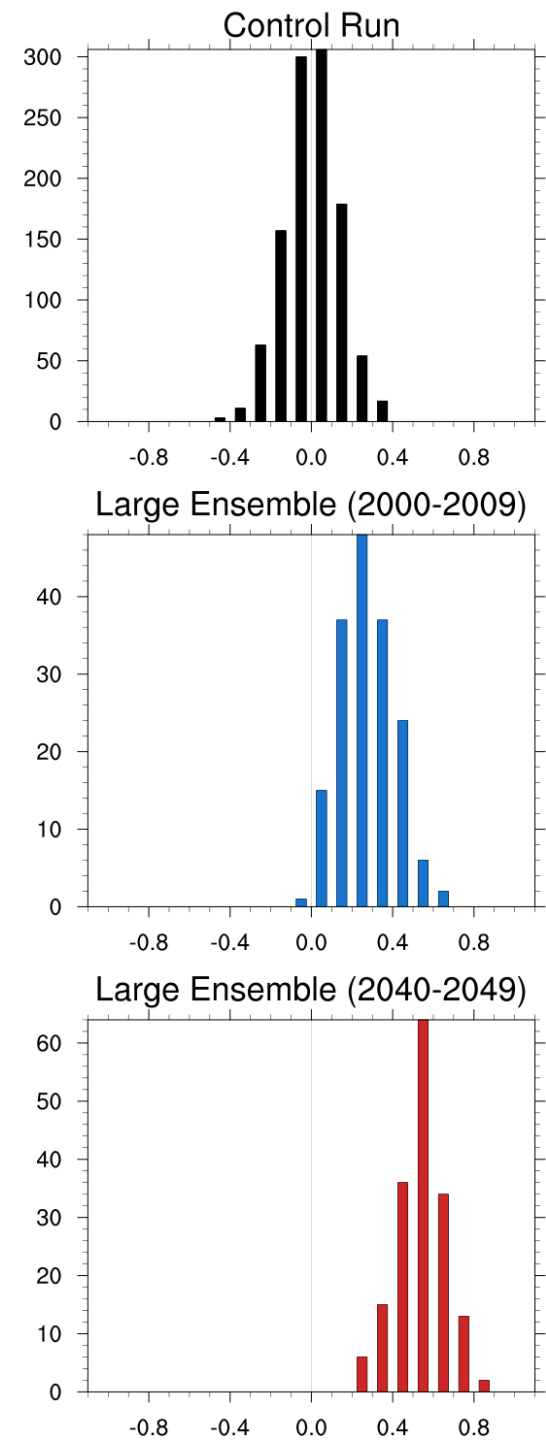
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We are interested in using daily sea ice concentration data to assess changes in polar bear sea ice habitat over the 20th and 21st century.

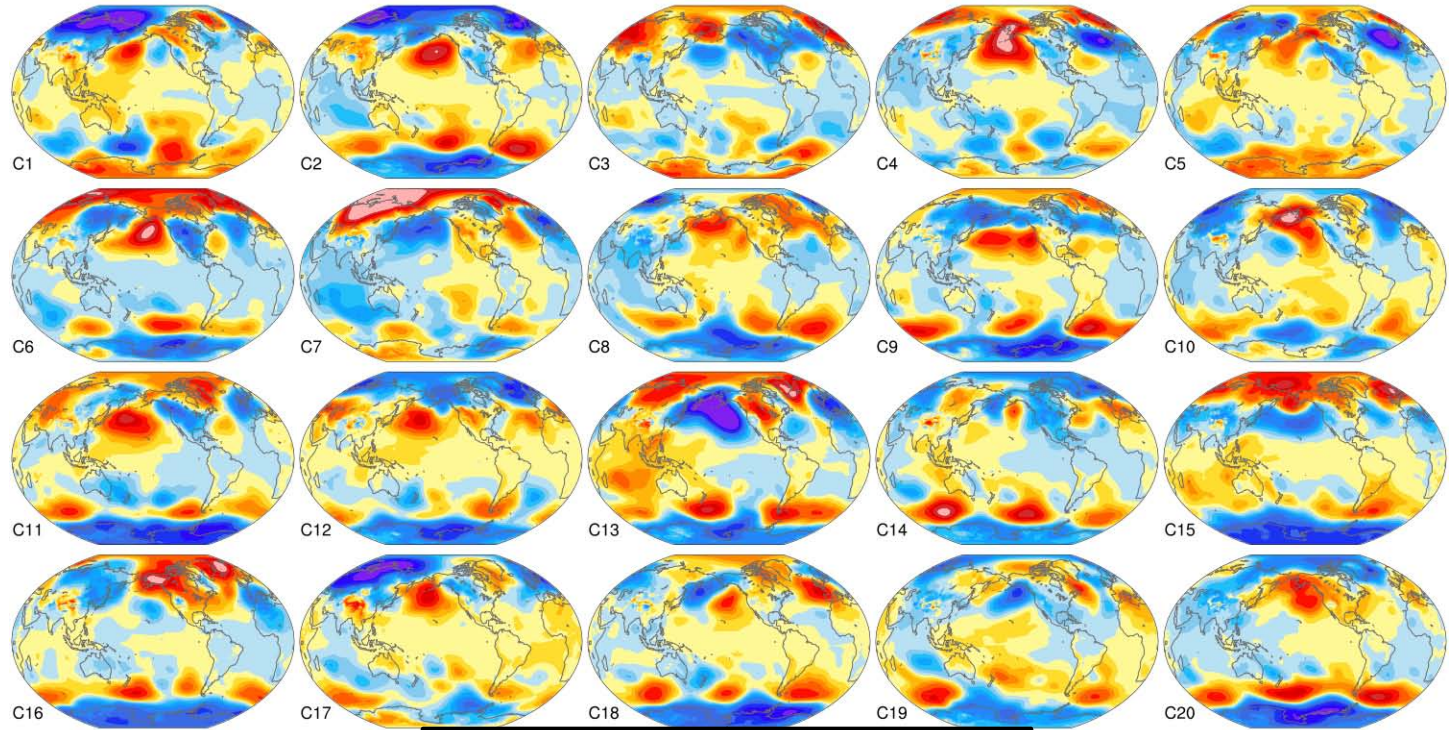
# Hiatus decades happen

*Kay et al. BAMS in prep*

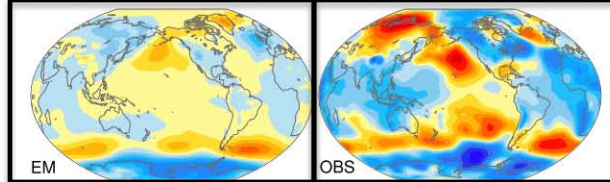
Figure shows histograms of decadal trends in global mean surface air temperature in the 1850 control (top), early 21<sup>st</sup> century (middle), and mid 21<sup>st</sup> century (top).



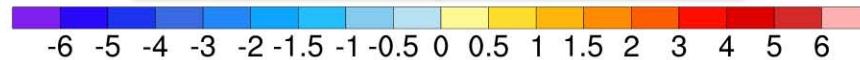
# The single realization problem: DJF SLP Trends 1979-2012



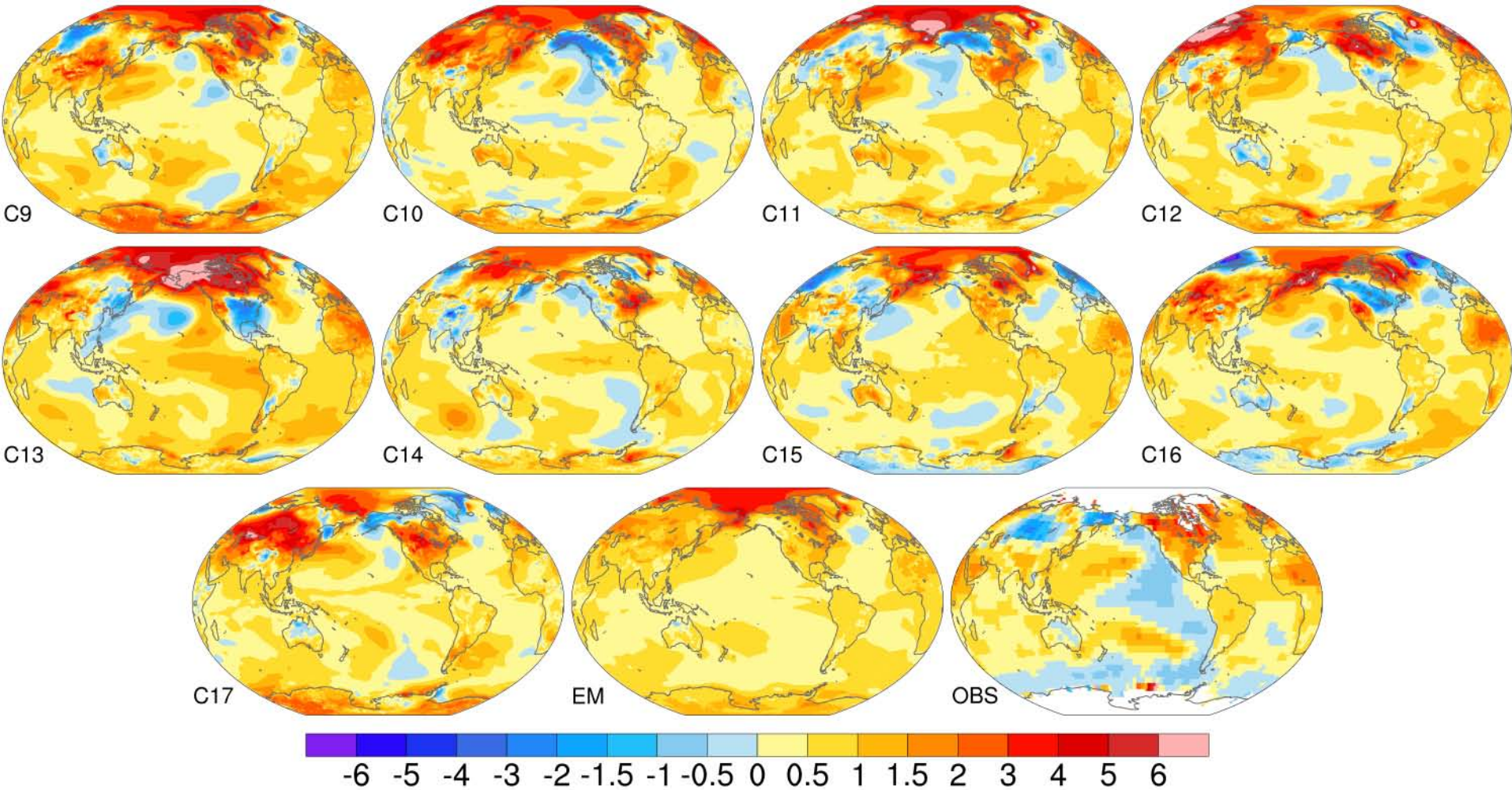
**Forced  
(20 run avg)**



**Observed**



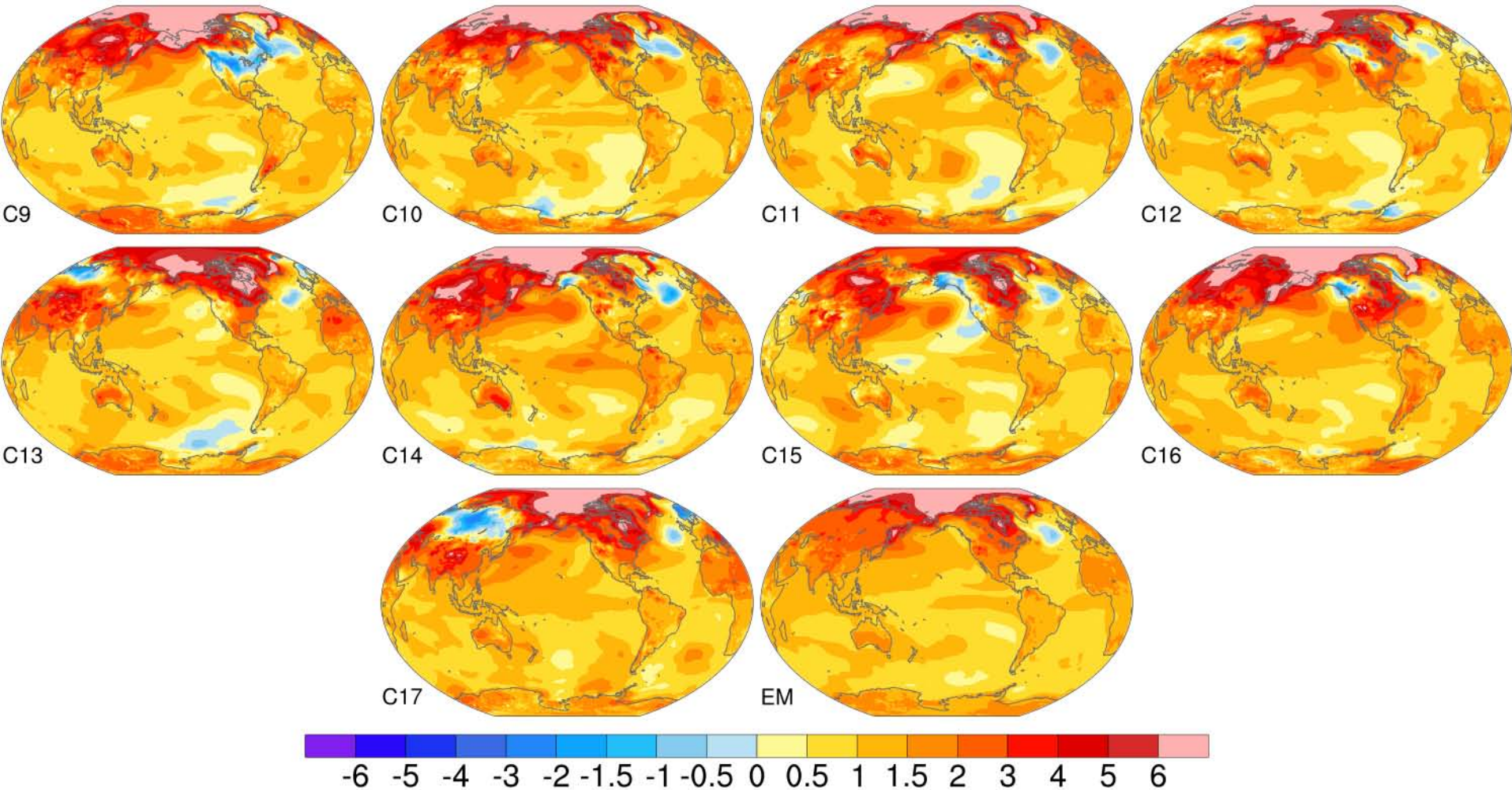
# The single realization problem



Panels show 1979-2012 DJF surface temperature trends for 9 ensemble members, the ensemble mean, and observations.

# A warmer future with regional uncertainty

*Kay et al. BAMS in prep*

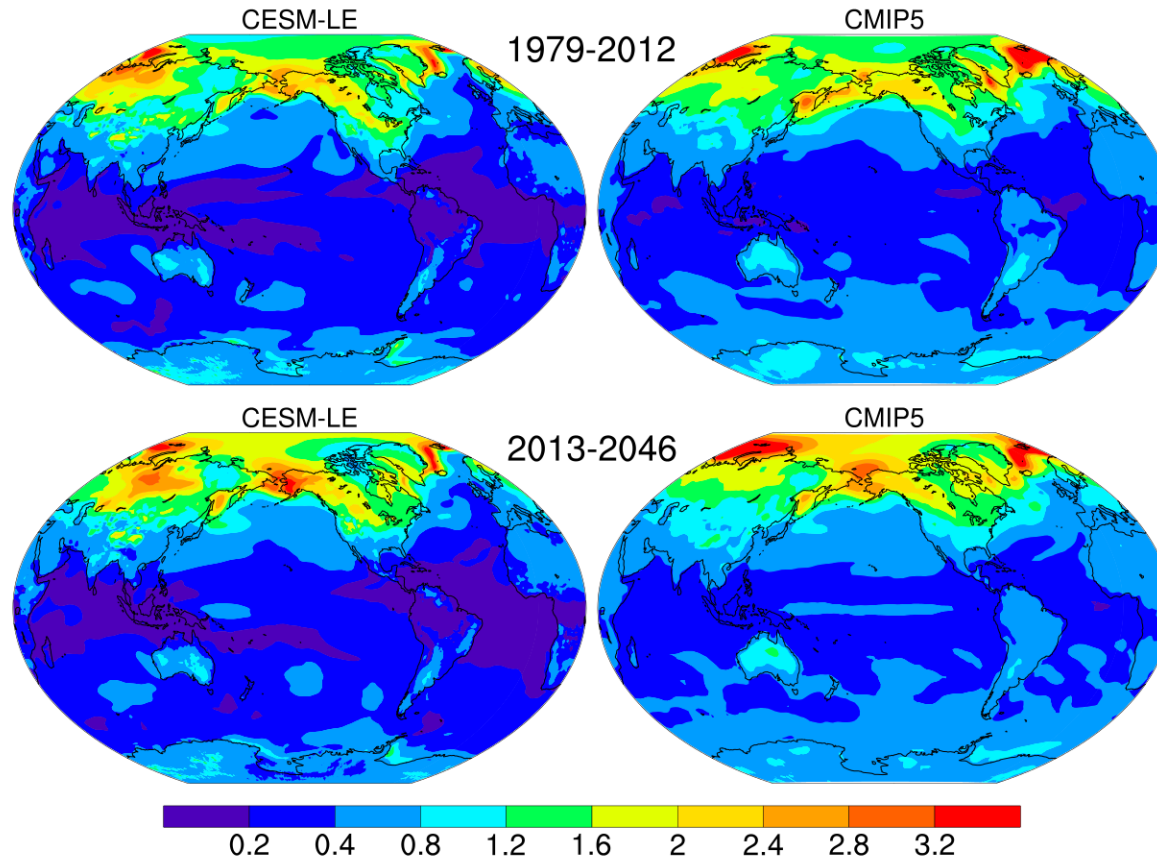


Panels show 2013-2046 DJF surface temperature trends for 9 ensemble members and for the ensemble mean.



# Internal variability vs. CMIP5 variability

*Kay et al. BAMS in prep*



Panels show standard deviation of DJF surface temperature trends for the CMIP5 Ensemble and for the CESM-CAM5 Large Ensemble.

# Summary

- The CESM-CAM5 Large Ensemble project is well underway thanks to the efforts of many.
- We plan to “release” 30 ensemble members/1850 control at CESM Meeting in June 2014.
- Any scientist is welcome to use the outputs from this community project. Just e-mail Adam Phillips (asphilli@ucar.edu) to be added to the list of projects on the website.
- Plots courtesy of *Climate Variability Diagnostics Package*
- Questions?