

The CESM Last Millennium Project

Pieter Bruegel the Elder 'Hunters in the Snow'

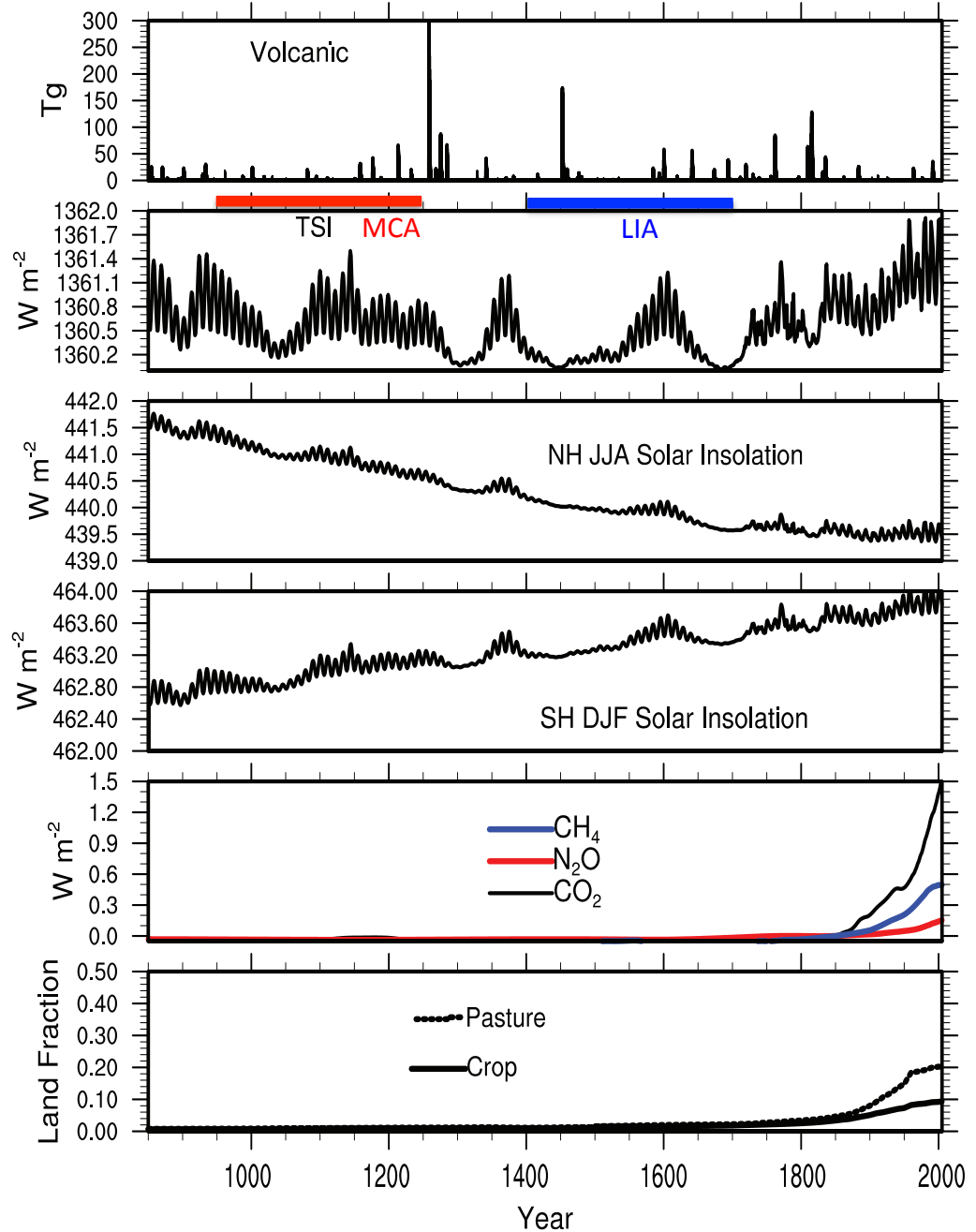


Bette Otto-Bliesner

Toby Ault, Esther Brady, Nan Rosenbloom

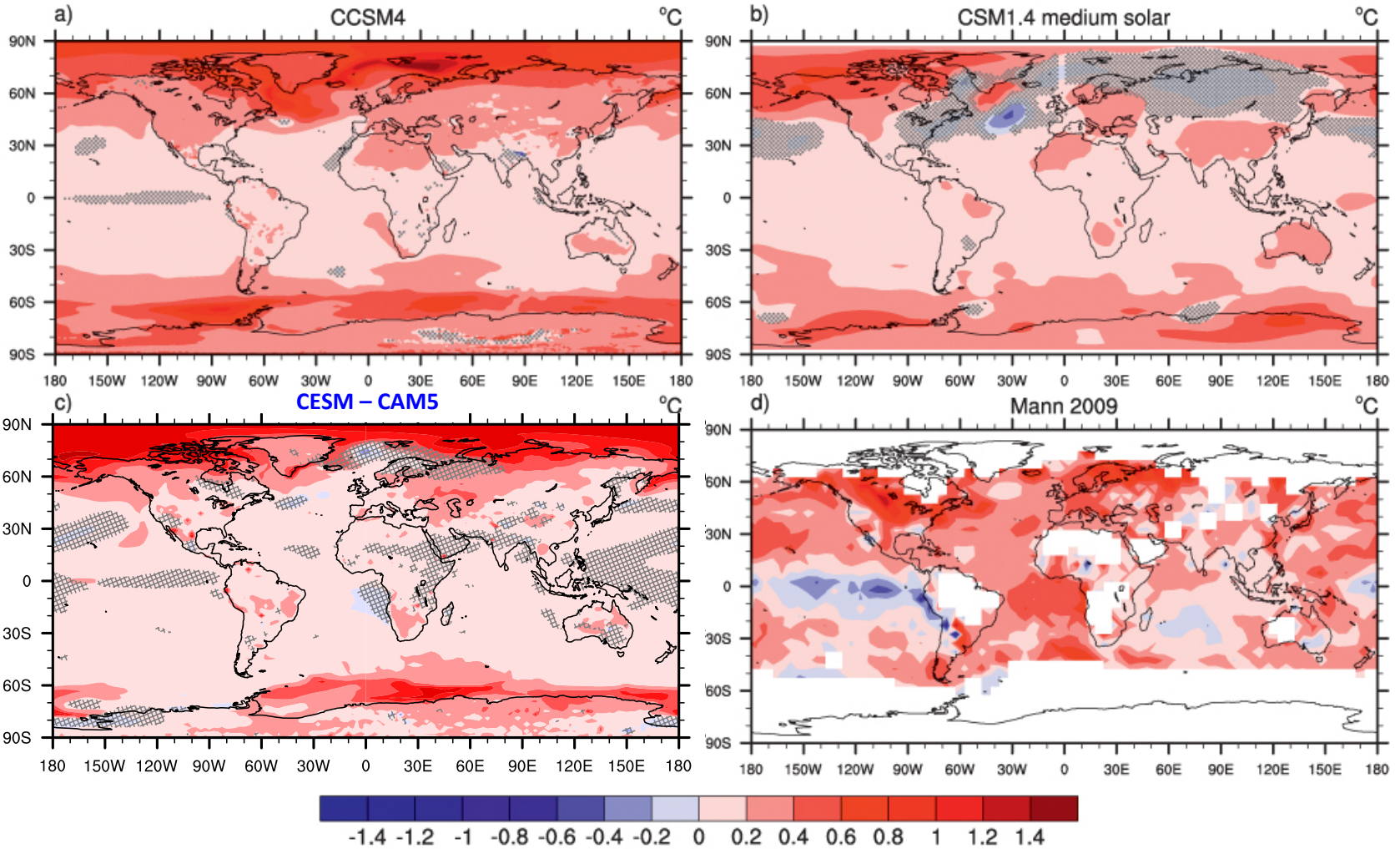
Andy Mai, Jim Edwards, Gary Strand, Adam Phillips

CMIP6-PMIP6
Last Millennium
Simulations
with CESM-CAM5
FV2x1



Flavors of CESM for Last Millennium

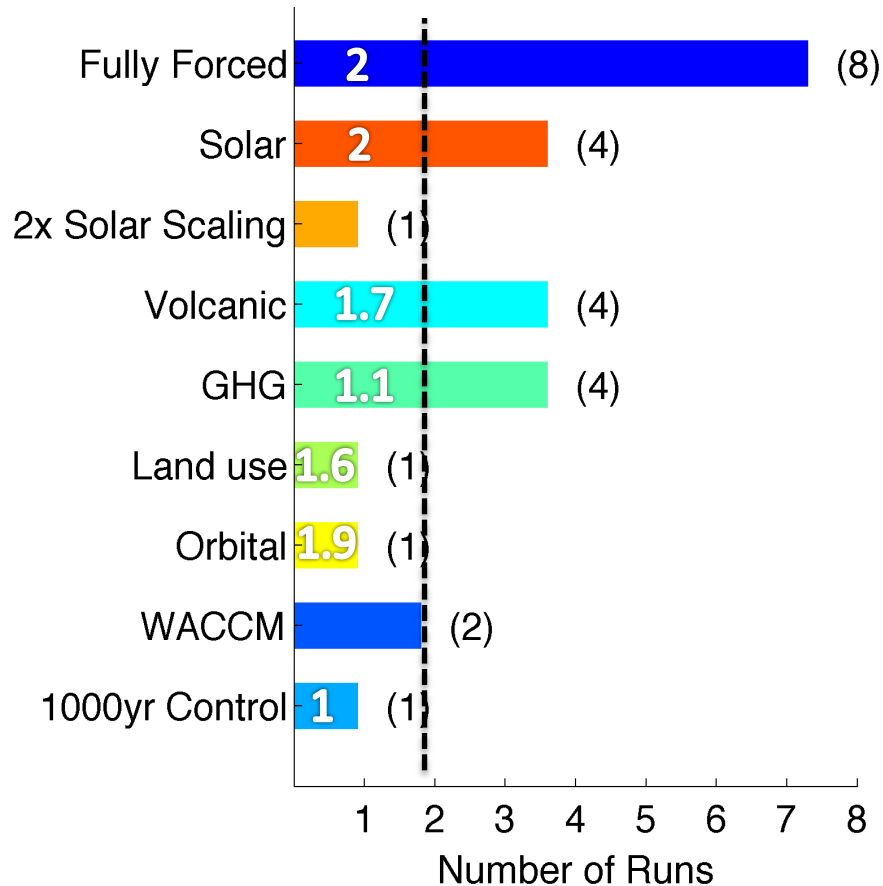
Surface temperature change: MCA – LIA



Community Simulations with CESM-CAM5

850-1850 (natural) + 2005 (anthro) ... 2100 (RCP8.5)

Ensembles: similar to design of LE

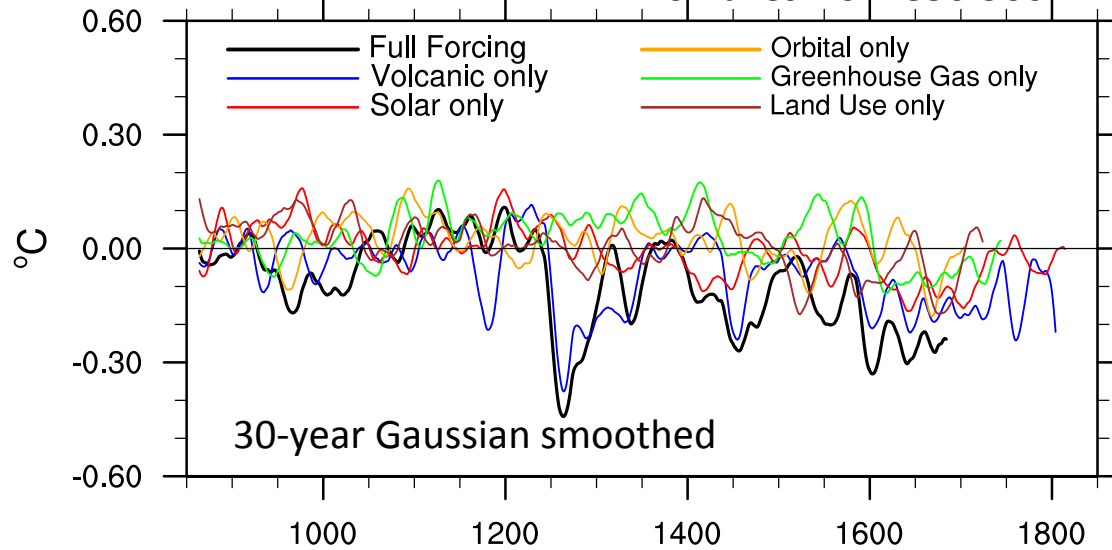


26 simulations

- Atmosphere: CAM5, 1.9 x 2.5°, 30 levels
 - Land: CLM4, same resolution as atmos.
 - Ocean: POP2, 1.1 x 0.27-0.54°, 60 levels
 - Sea Ice: CICE4, same resolution as ocean
-
- Yellowstone computer, we can simulate ~25 years per day, getting a full simulation from 850AD to 2005 in ~45-50 days*

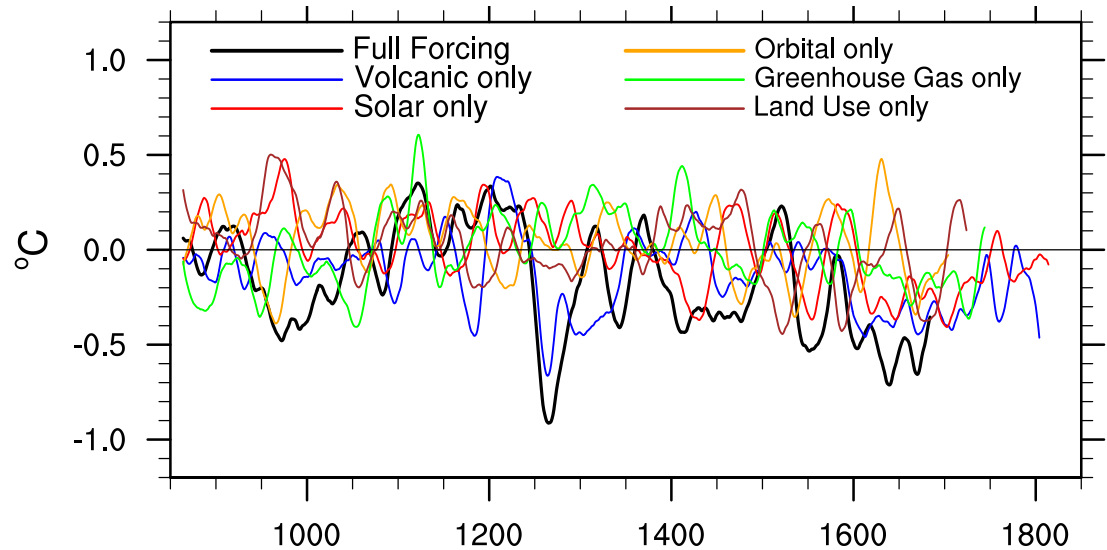
Surface temperature – Ensemble members #1

Anomalies from 850-900 FF



Northern Hemisphere

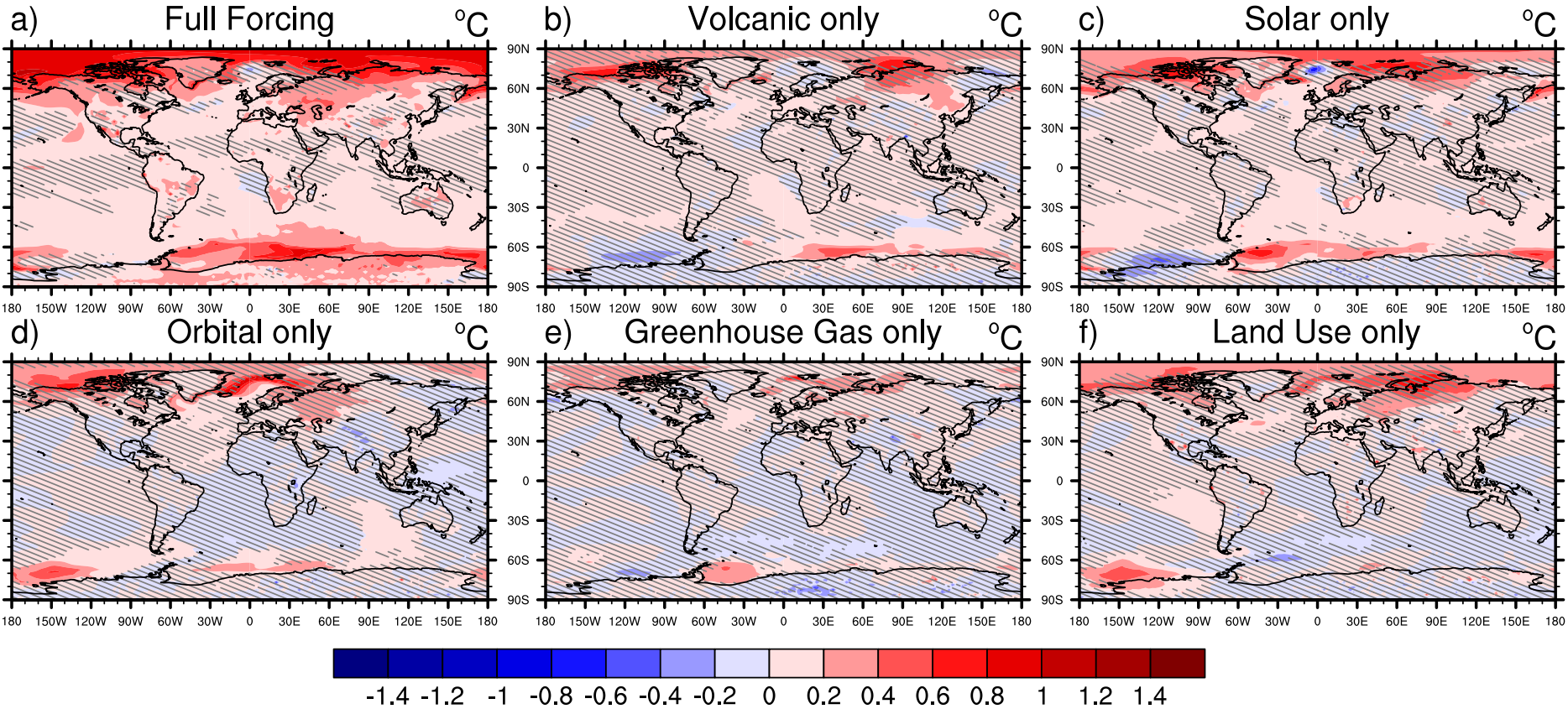
Arctic land areas



Single forcing experiments – Ensemble member #1

Surface temperature change: MCA – LIA

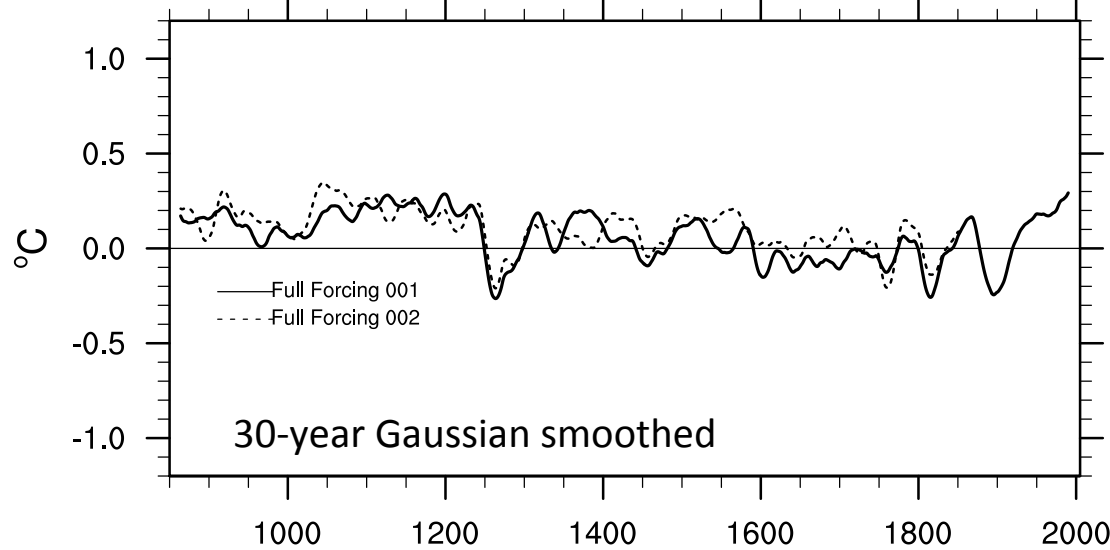
Surface temperature change: MCA – LIA



Hatched areas not significant at 95% CI

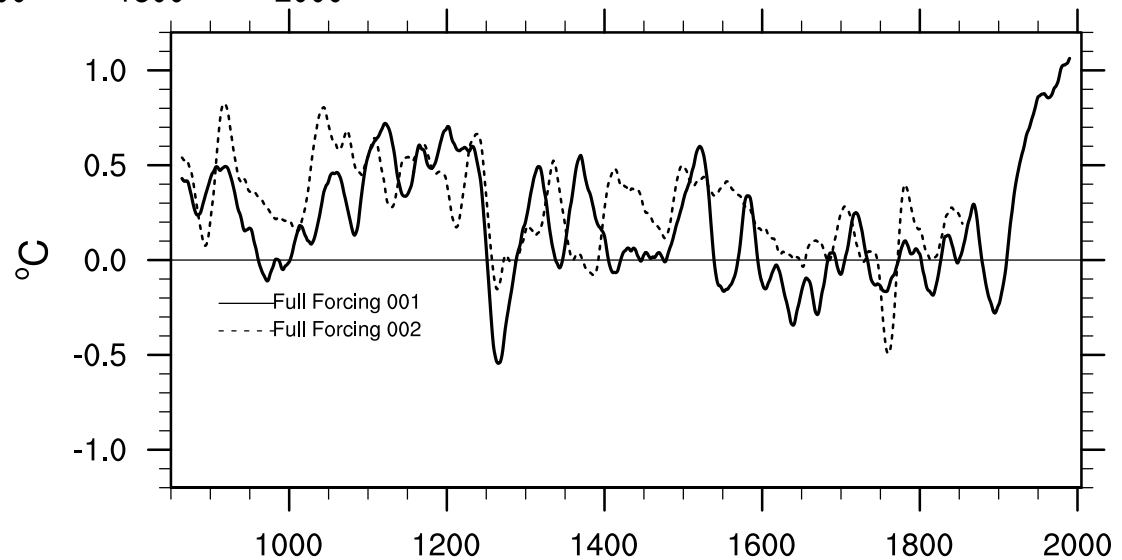
Surface temperature – Robustness of response

Anomalies from 1850-1899 FF.001



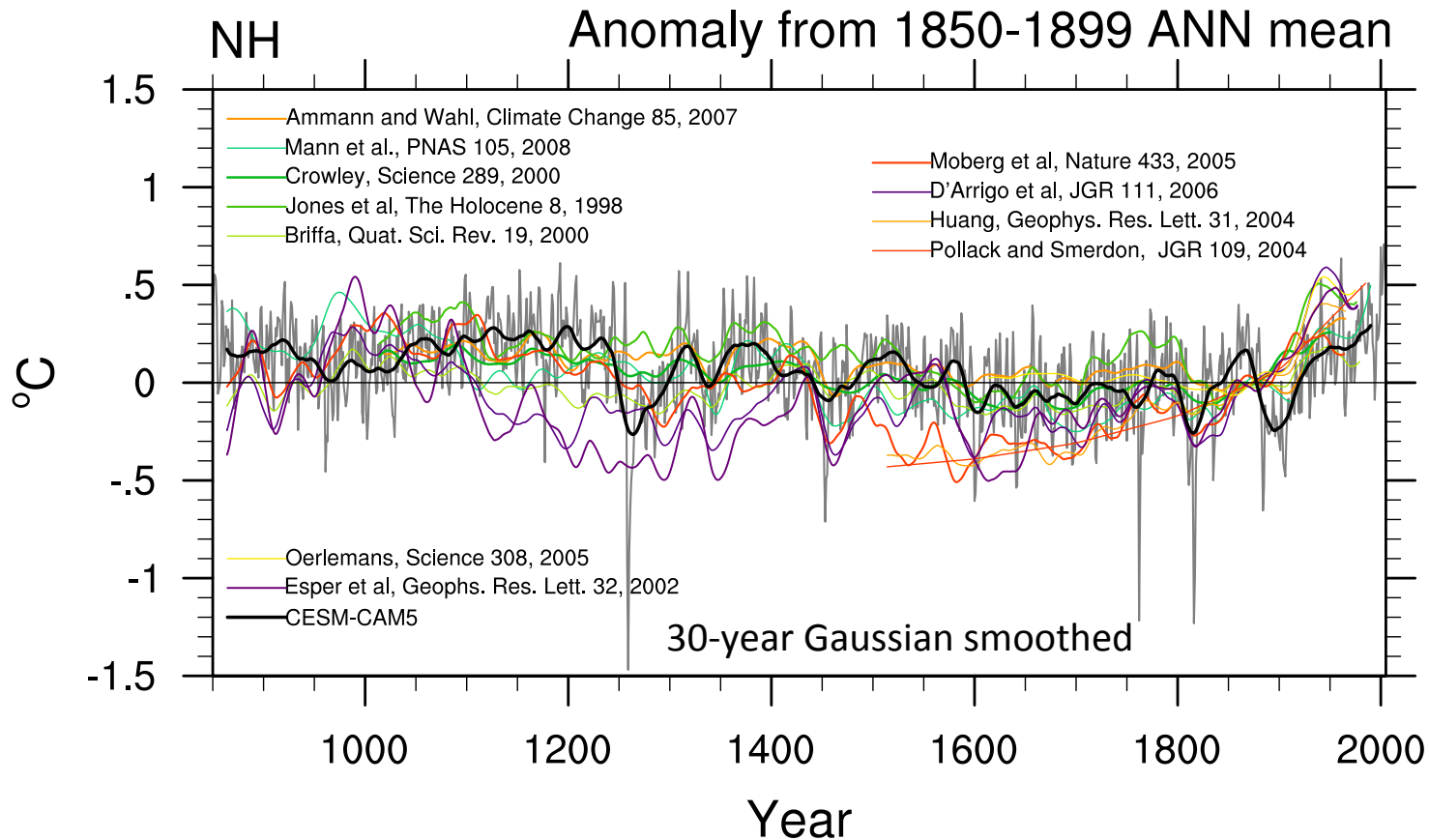
Northern Hemisphere

Arctic land areas

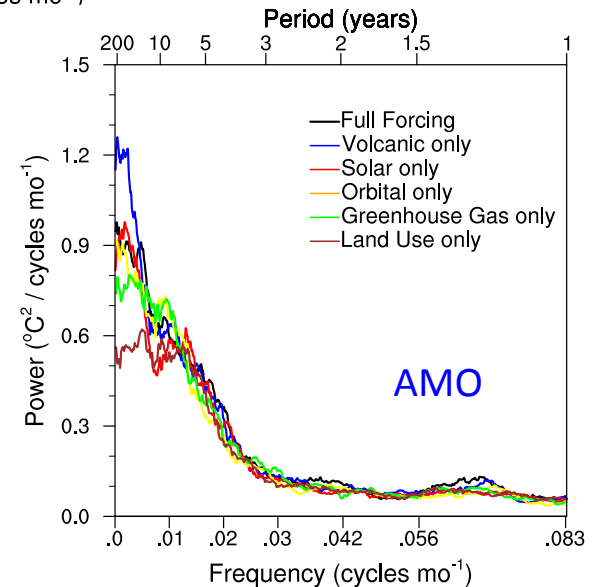
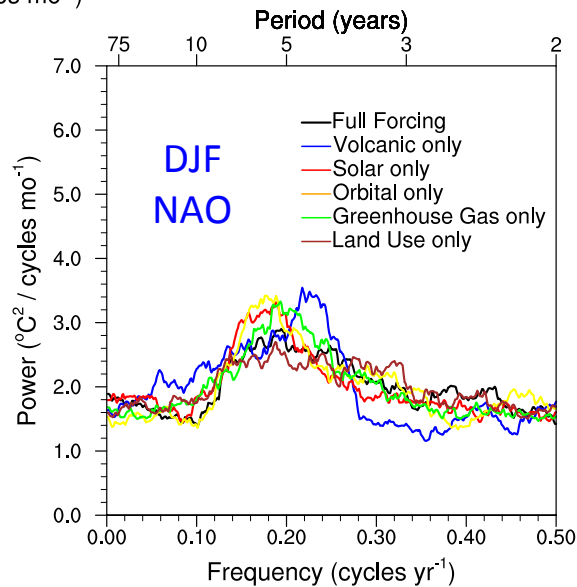
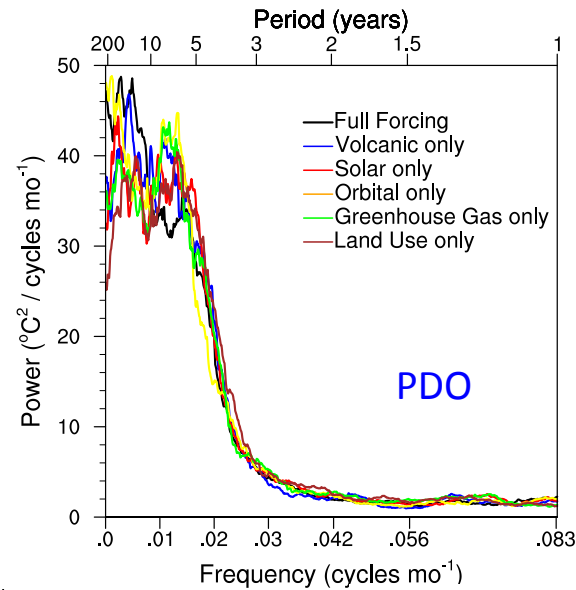
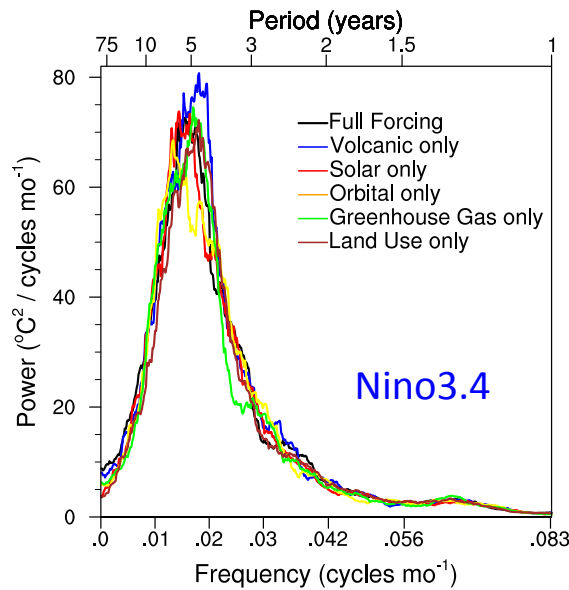


Full forcing vs Proxy reconstructions

Northern Hemisphere surface temperature



Spectra of Modes of Variability – Ensemble members #1



Next Steps

- Complete ensemble, extending all to 2005, and possibly a RCP8.5 extension to 2100
- Article to be submitted to *Nature Geosciences*
- Release in Fall 2014 – Model results on ESG
- Unique opportunity to use simulations and data together to assess and attribute regional climate changes –
Goal: dynamically consistent explanation of responses
- Community opportunity to do additional simulations
- Update with new simulations as model developments become available: i.e. water and carbon isotopes