WACCM Whole Atmosphere Community Climate Model

WACCM Updates for CESM

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Community Earth System Model CESM

WACCM6 Update

- Prognostic Stratospheric Sulfur
- Updated Chemistry
- Internally Generated QBO
- WACCM-X version 2
- WACCM for CESM2
- Timelines

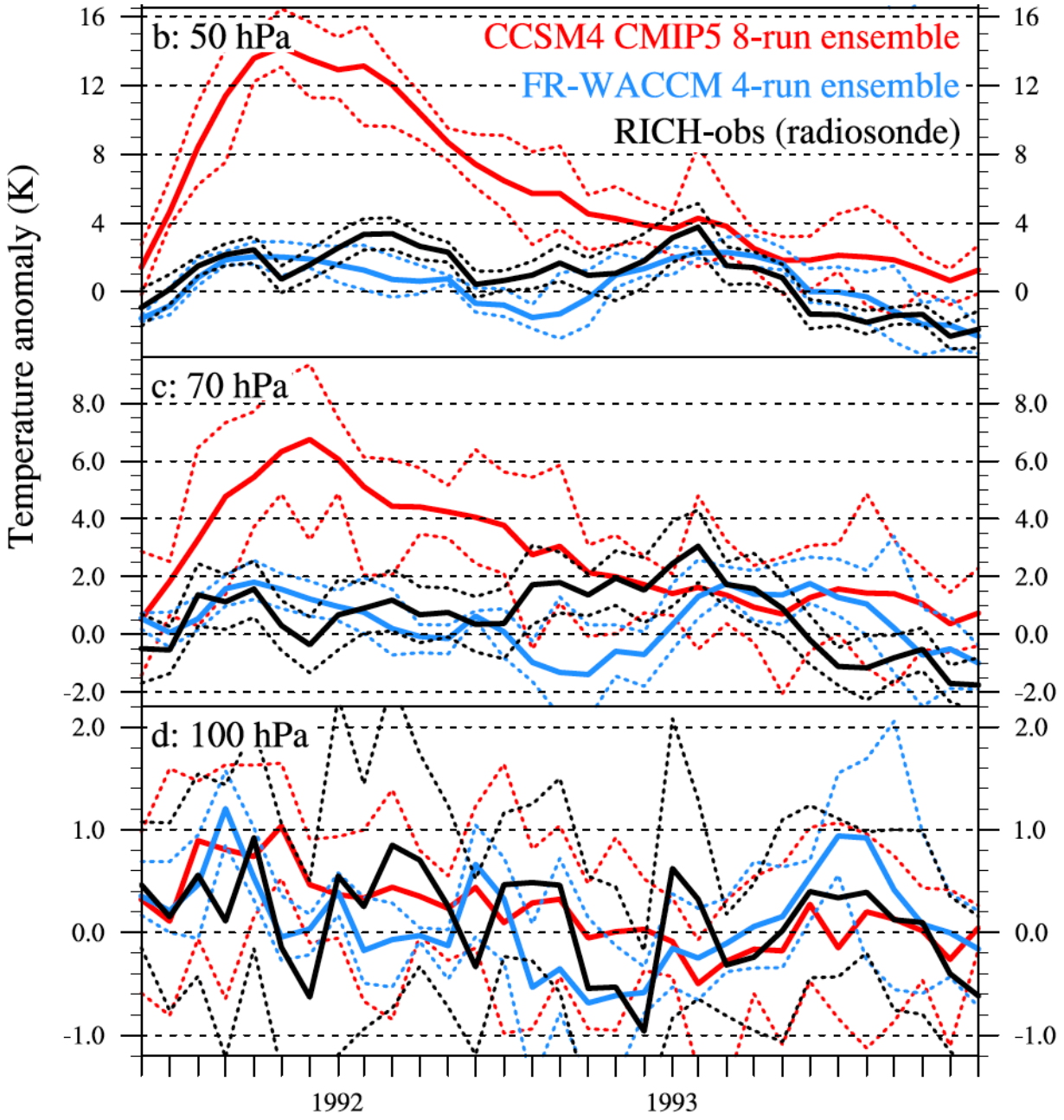
Prognostic Stratospheric Sulfur

Emit volcanic emissions into MAM4 and let them evolve.

Example: Pinatubo. Much better lower stratospheric Temperature anomalies

Ready to test in CAM now. Database from 1850-2015.

Mills et al 2016



Quasi Biennial Oscillation (QBO) in CESM-WACCM

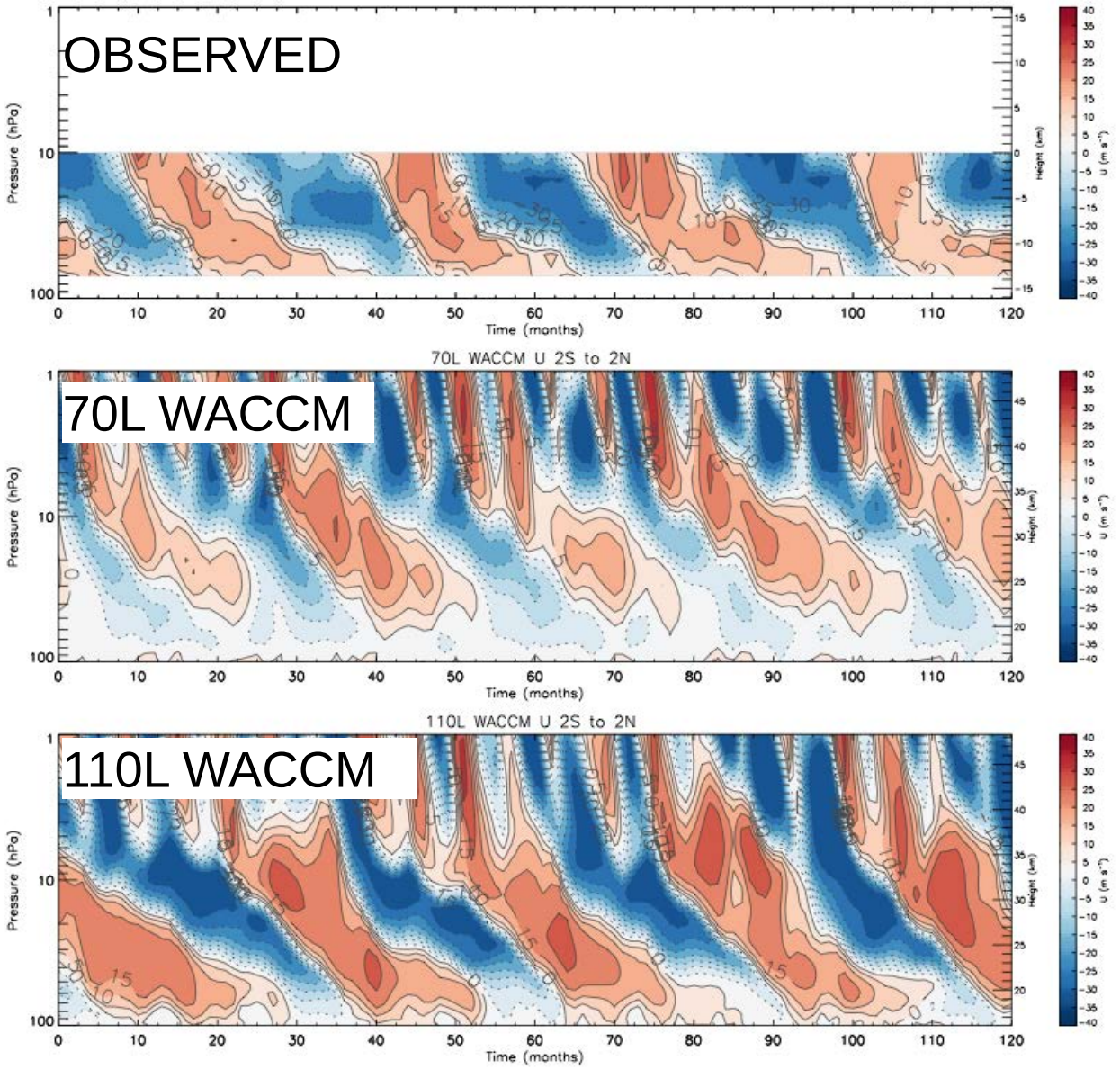
- CESM-WACCM5 can simulate the QBO
- Expect to have a version of WACCM6 with a QBO

70L (standard WACCM5.3)
Looks 'okay'

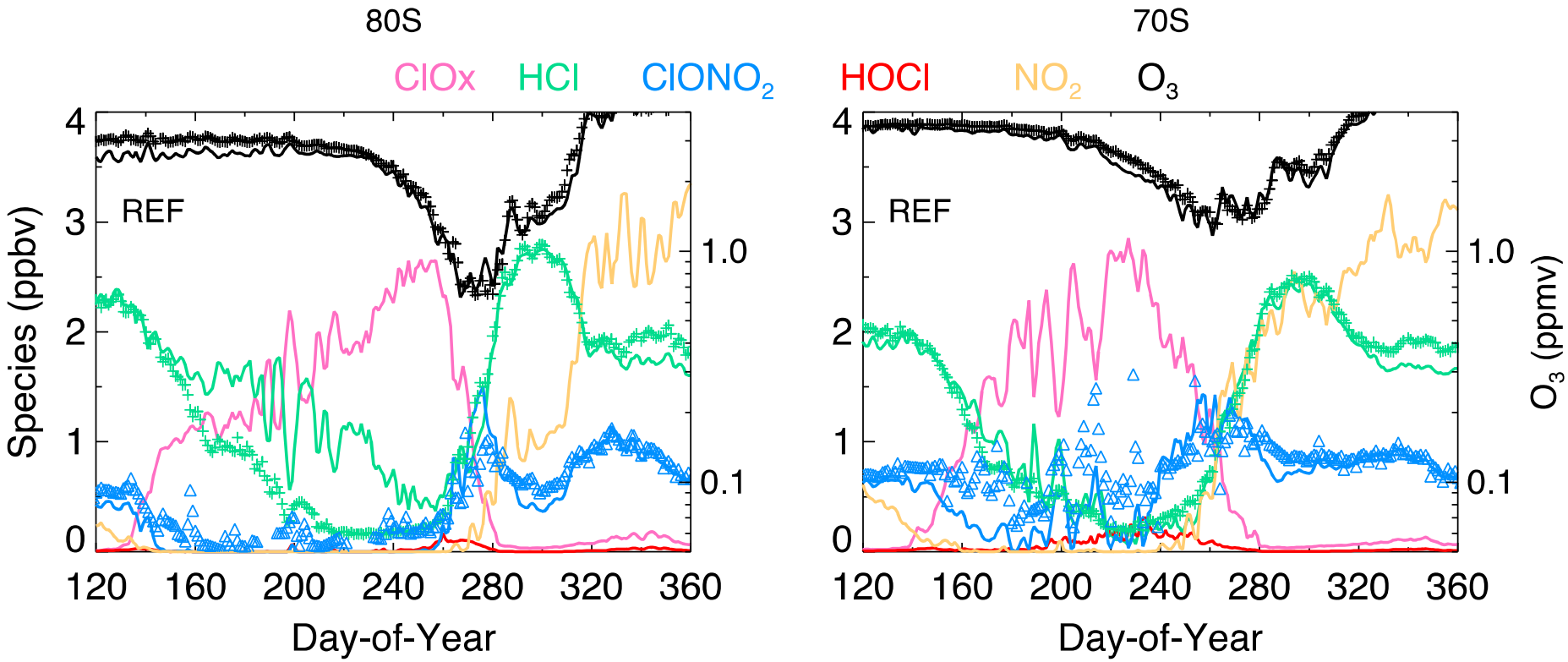
110L 'Ideal'

From J. Richter

Equatorial Zonal Wind (U)

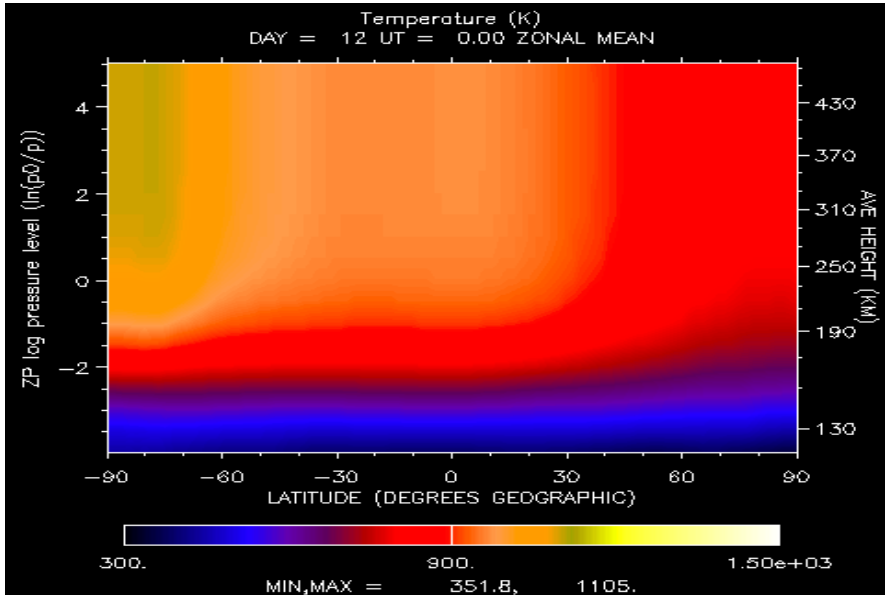


Updated Chemistry

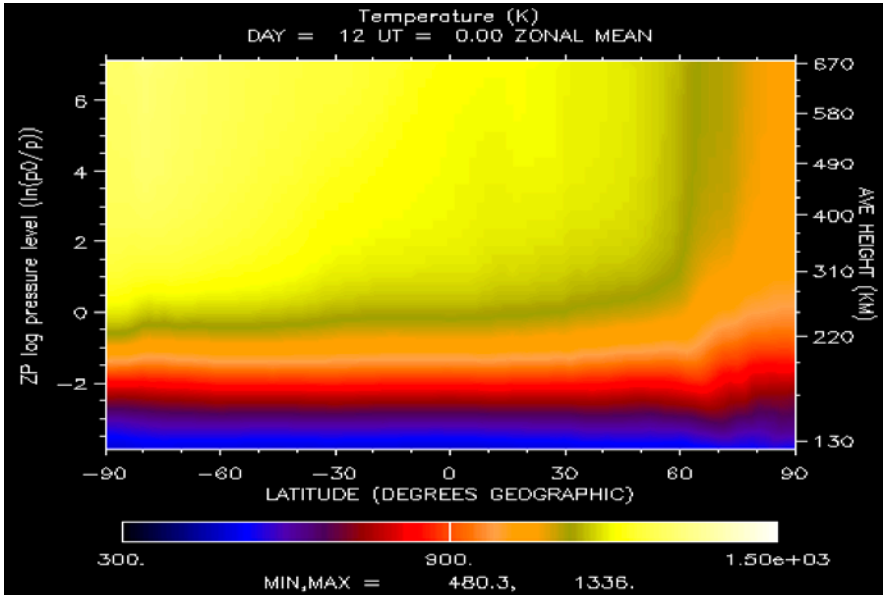


Amazing representation of stratospheric chemistry. Comparisons above are made with: Aura MLS (HCl, O_3); MIPAS ($ClONO_2$).

Previous WACCM-X Release



Current WACCM-X

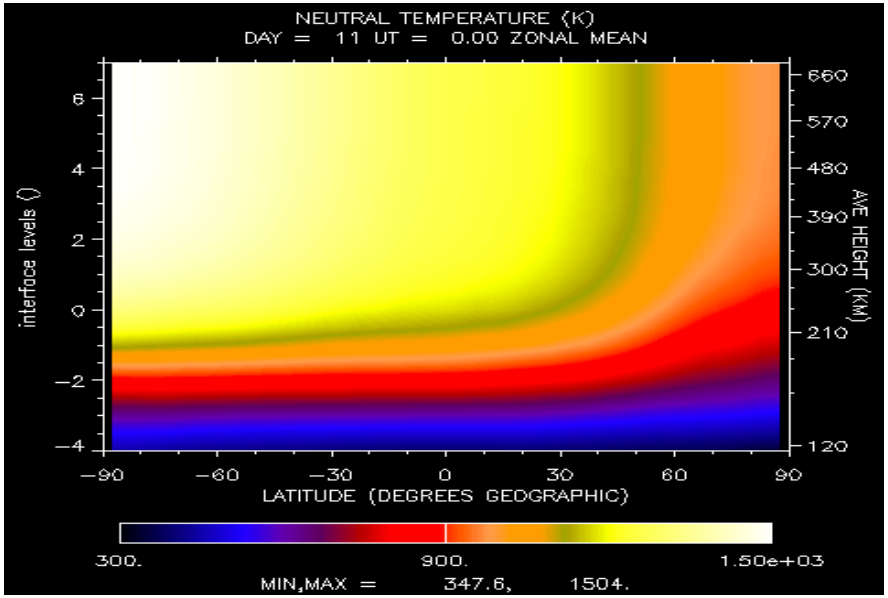


WACCM-X: Now in the Thermosphere!

Thermosphere Temperature Structure (January)

J. McInerney, H. Liu, S. Solomon, HAO

TIE-GCM



WACCM Changes for CESM2

- WACCM5.4 being used now
- WACCM5.5 running, finalizing for WACCM6
- Identified two conservation issues for stratosphere in CLUBB
  - Fix reduces RESTOM-RESSURF in CAM
- Modifying CAM moist physics for stratosphere
  - Dehydration in clean, cold regions (ice saturation adjustment)
  - Ice microphysics for lower stratosphere
  - Will affect tropical cirrus clouds
- Discussion of Momentum Forcing
  - What parameterizations are being used?
  - Need to be consistent between CAM & WACCM

WACCM6 Configurations

- WACCM6 L70, 1°, FV
  - Specified and full chemistry (TSMLT)
- WACCM6 L114, 1°, FV
  - Matches a L64 CAM
  - Specified and full chemistry (TSMLT)
- WACCM-X 2.0
  - Includes description of ionosphere
- COMP Sets: 2° FV and MA chemistry

WACCM Timelines

- Volcanoes: done. Ready to test in CAM.
- Moist physics adjustments: Complete in Feb
- Check climatology for WACCM (Feb)
- Need decision on momentum budget (March)
- Modify (tune) GW: April-Jul
- WACCM historical simulations (REF-C1) summer
- WACCM Coupled simulations: Fall