WACCM Updates

A. Gettelman, L. M. Polvani, M. Mills
+ “WACCM Team”
Outline

• Logistics
• CESM2 Timelines
• WACCM Development (examples)
Agenda For This Week

• Today: WACCM (FL2-1022)
  – Overview & Updates
  – Summary from major groups
  – Science!
  – Discussion

• Wednesday AM: Joint with AMWG/ChemWG (FL)
  – Joint science and discussion (FL2-1022)

• Wednesday PM and Thurs: Joint (CG)
  – WACCM overview
  – Make sure WACCM is represented in CESM2
Logistics

• CESM Meeting Agendas, Bus schedule
  – [https://www2.cesm.ucar.edu/events/meetings/20160208](https://www2.cesm.ucar.edu/events/meetings/20160208)
  – Google “cesm working groups 2016”
• Today and Wed AM: This Room
• Wed PM/Thursday: Center Green
CESM Tutorial: 8-12 August 2016

- Excellent introduction to CESM
  - Science and practical sessions
- WACCM Special session
- Applications now until March 4, 2016
- [https://www2.cesm.ucar.edu/events/tutorials/2016](https://www2.cesm.ucar.edu/events/tutorials/2016)
- Please mention WACCM, talk to Mills or Gettelman and mention us on application
CESM2 revised timeline

- **Feb 2016**: WG meetings
- **Mar. 1 2016**: All WGs define final additions and timeline
- **June 2016**
  - CESM2.0 Sessions at Breckenridge
  - Definition of CESM2.0
- **Jul. 1 2016**
  - Code Freeze
  - Document impacts in coupled simulations
  - Code available through developers’ access
- **Sep. 1 2016**
  - Code freeze
- **Dec 2016**
  - CESM2.0 Release
  - Full release
  - All functionality
  - CMIP6 1°

Pending approval by the SSC
WACCM Development Updates

• WACCM-CCMI
• WACCM5.4 Tuning
• WACCM5.5
• WACCM-X
• Prognostic Volcanoes
Amazing representation of stratospheric chemistry. Comparisons above are made with: Aura MLS (HCl, O₃); MIPAS (ClONO₂).


WACCM5.4 – U Climatology

WACCM5.4 does a good job of reproducing wind climatology

From J. Richter
WACCM5.4 – T Anomalies

WACCM5.4 does a good job of reproducing temperatures

From J. Richter
WACCM5.4: QBO

WACCM5.4 has an internally Generated QBO @ 70 Levels (Better for 110L)
WACCM5.5 Updates

• Get WACCM5.5 working with CAM5.5 Physics

• Issues
  – Conservation
  – Dehydration
  – SAD Ice (Type 2 PSCs)
WACCM5.5: Type-2 PSCs

Adjusting CAM6 physics
1. Conservation (H₂O)
2. RH
3. SAD Ice (Type-2 PSCs)
4. Retune ice clouds

This result: from step 3
Will discuss process later

From: Bardeen
Volcanoes

Prognostic Stratospheric Sulfur in WACCM

Mills et al 2016, submitted
WACCM-X
Thermosphere Temperature Structure (January)

See McInerney Talk
Other Science Efforts

• Will hear from colleagues about other efforts with WACCM
  – CU
  – FMI
  – U. Leeds
  – NRL
WACCM Developments/Plans

A. Gettelman, L. M. Polvani, M. Mills

+ “WACCM Team” (You!)
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**Document impacts in coupled simulations**

**Code available through developers’ access**

Pending approval by the SSC
Proposed WACCM Configurations

- **WACCM6 L70, 1°, FV**
  - Specified and full chemistry
- **WACCM6 L110, 1°, FV**
  - Matches a L64 CAM
  - Specified and full chemistry
- **WACCM6 L110, 2°, FV**
  - Specified and Full Chemistry
- **WACCM-X 2.0**
  - Includes description of ionosphere

This is probably either 1° OR 2°
Current developments for CESM2

Two levels: (1) CMIP/DECK issues, (2) Other configurations  (More flexible on (2))

• Pace CAM6 Physics
  – WACCM6 climatology: Temp, RH, SAD_{ice}, O_3
  – Adjustments to Gravity Waves
  – Use CCMI chemistry

• Forcing data sets
  – Volcanic forcing (Neely, Schmidt database)
  – Solar forcing (new specification)
  – Lower Boundary Condition files? Past 2005?

• WACCM-X release

• What is missing for CESM2? (Needed for March)
Capturing Other Development

Do we want these for the WACCM Trunk?
  – Available as options?

• WACCM-X (Common interface w/ NRL Ionosphere: Timestep dependence of climate)
• FMI D-Region Ions (Yes: try)
• WACCM-DART? ‘Should run: Dart Scripting’ (Yes)
• CU PSCs
• CARMA Updates (PSCs, Aerosols)  Maybe?
• Leeds Metal ions
• (h4 capturing zonal mean for TEM, include GW forcing in CCMI...)
• WACCM-SC mesosphere ozone fix (Marsh)
• Sathist Scaling (slow).
WACCM6 Development Strategy

• CCMI Chemistry: DONE
• WACCM6 with CAM6 physics: functional: DONE
• Adjust SAD ice, check $O_3$ (SD-WACCM)
• Tune $H_2O$ and RH (Free running)  
• Incorporate any changes to drag/momentum
• Tune GWD for T climatology, QBO, SSW, SAO, Tides
Timing

- Finish WACCM mods to CAM physics (1-2 months)
- Will need to discuss any changes to Momentum
- Start tuning GWD for Temps and SSWs by April
  - Aiming for June-Sept
  - 90% tuning with current GW schemes
  - Tune in WACCM-SC (beginning)
- WACCM-SC Timing? DECK with WACCM6-SC?
  - Do most
Questions for other WGs...

• When does WACCM need to be ready?
  – How are we spinning up an ocean?
  – Careful on configurations between CAM/WACCM
  – What are we running (multiple ensembles)
  – Forcing: daily zonal means (confirm)? Or 3D? ChemWG

• What are plans for surface stress/wave drag
  – CESM co-chair level group working on this
  – No more coupled tuning until we decide.

• What configurations do we recommend/support?
  – Is this consistent with rest of CESM2.

• DECK with WACCM6-SC? [may have to tweak code]
  – Do most MIPs with high top model

• Other Questions for Tomorrow...