

# Chemistry-Climate Working Group Meeting June 2013

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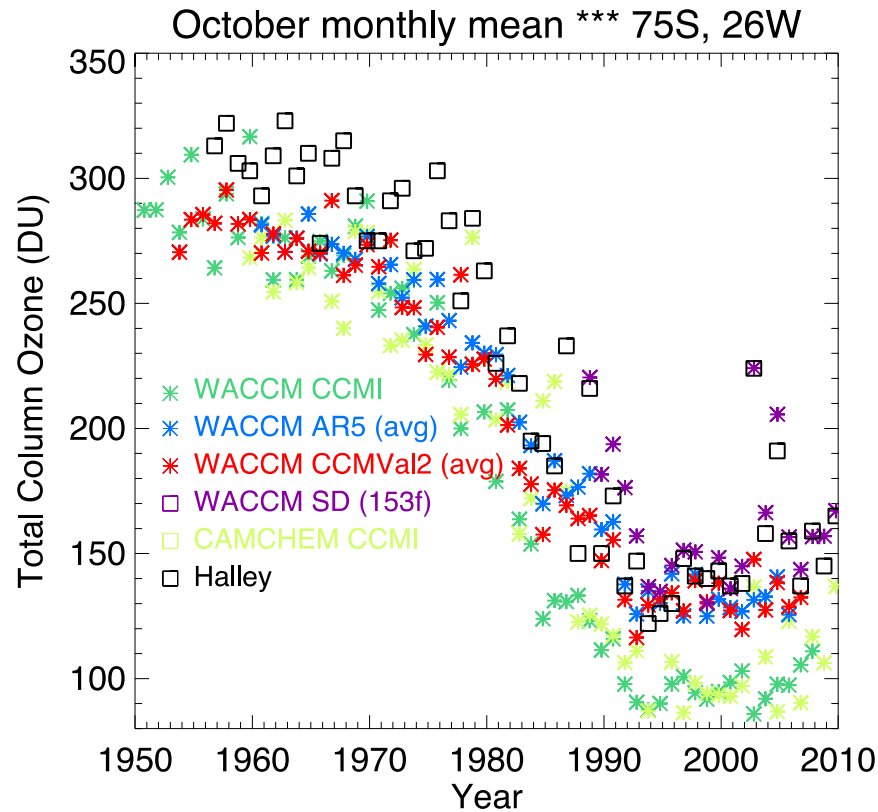
# Recent/on-going news & activities

- CESM1.2 release (more discussion by S. Tilmes)
- Outcome of February meeting
  - Bug fix on tropospheric aerosol surface area from MAM
  - Participation in organic aerosol AeroCOM intercomparison (led by K. Tsigaridis)
- Several outside papers with CAM-chem (make sure you let us know of your publications)
- Extensive MAM development and aerosol branch (more discussion by S. Ghan)
- Updated prescribed volcanic aerosols and optics (better representation of Pinatubo impact; presented in Marika's talk)
- CCM1 development

# CCMI

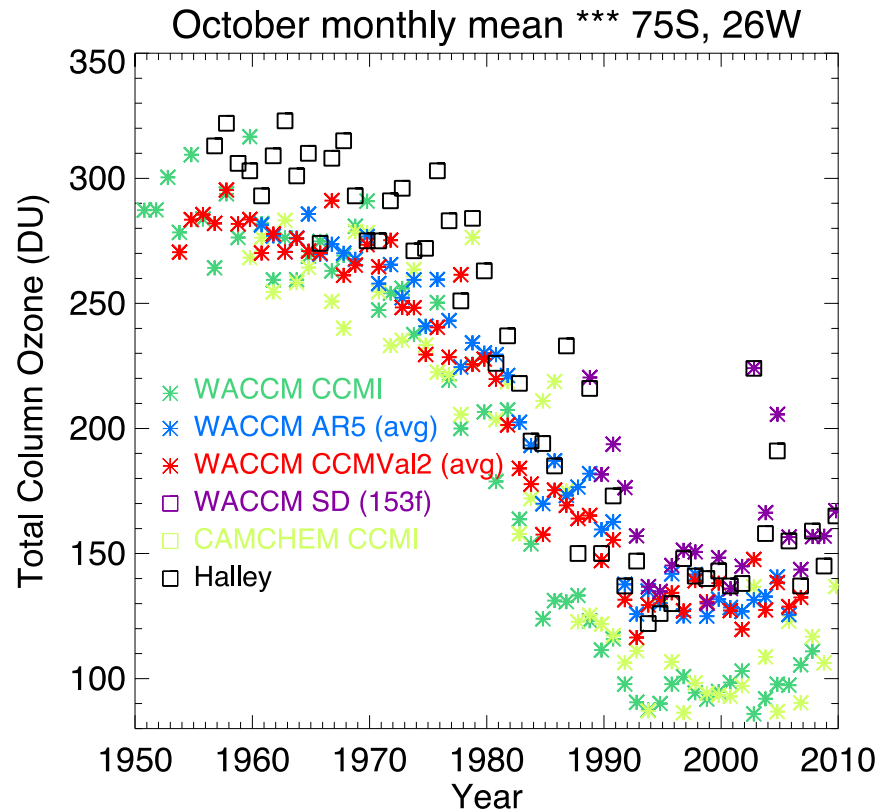
- 3 main simulations (3 member ensemble)
  - REF-C1: 1960-2010 (hindcast)
  - REF-C1SD: 1980-2010 (hindcast with specified dynamics)
  - REF-C2: 1960-2100 (RCP6.0)
- WACCM and CAM-chem simulations (trop/strat/BAM with updated SOA)
- Many additional diagnostics and tracers (tropospheric transport)

# Main (present) issue



Good news: total ozone column matches the WACCM results

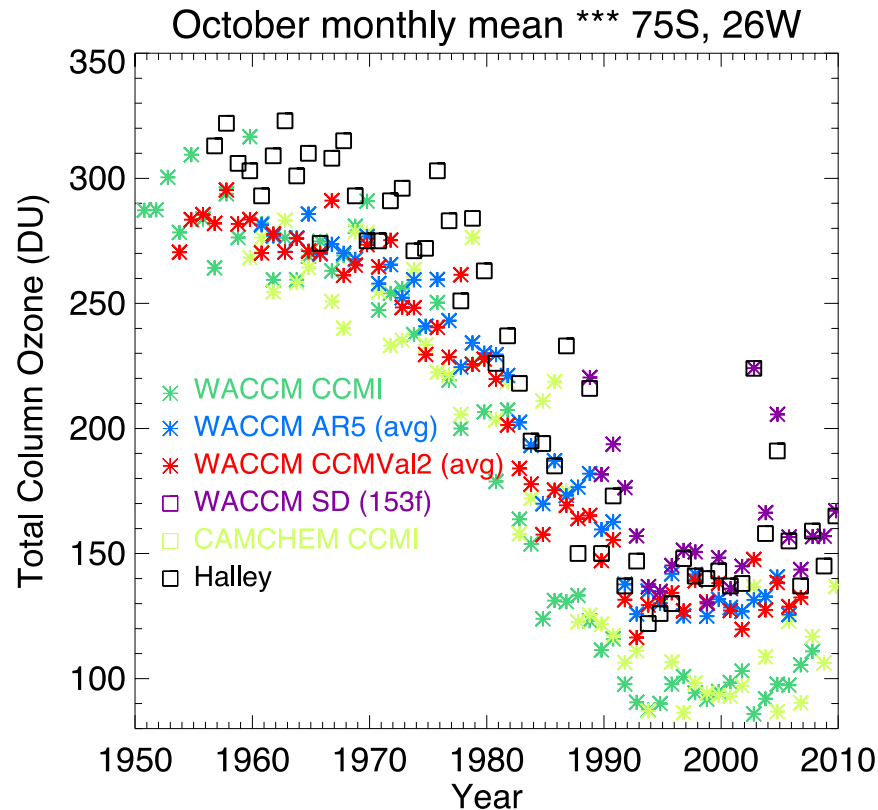
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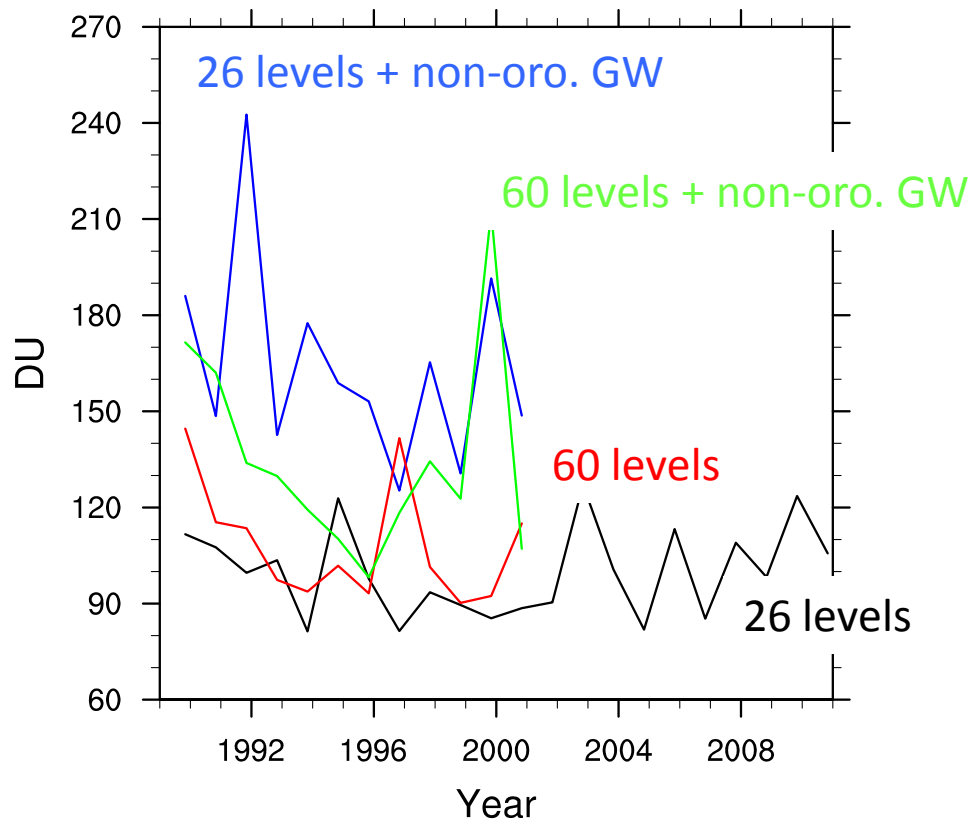
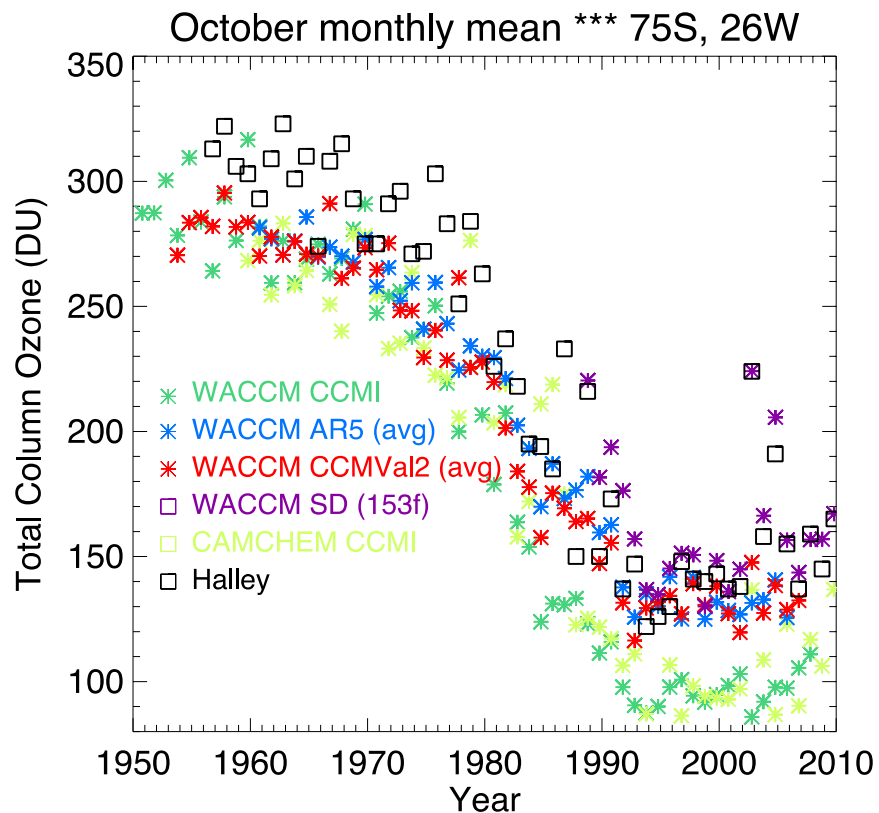


Good news: total ozone column matches the WACCM results

Bad news: total ozone column is much too low, because of too cold stratosphere and improved representation of ozone loss processes (looks great in WACCM SD run)

Approach: test with 60 levels and addition of non orographic gravity wave drag (on-going)

# Main (present) issue



# Items for discussion this morning

- Main science topics and biases
- Protocol (draft document sent last Friday) for model improvement and inclusion in trunk (includes metrics)
- Model development priorities
- CMIP6



# Rough Timeline for CESM2 Development

- Release target of May, 2016
- Component model targets for CESM2:
  - CAM6; POP-updated? Or MPAS-O; CLM5?; CICE5 (or MPAS-I?); Chemistry?; BGC?; WACCM?
- Timings for development
  - May, 2013 – CAM-SE; CLM4.5; Ocn BGC mods
  - May, 2014 – CAM-SE; CLM4.5; BGC mods; CISM2; POP-updated?; CICE5? WACCM-SE?
  - May 2015 -
  - May 2016 – CESM2 Release

# ChemClimWG Development Plan (from Feb meeting 2013 + updates)

- Update to MEGANv2.1/include maps when possible (in cesm1.2)
- Improvements/bug fixes to the dry deposition (Thanks to Maria Val Martin and Steve Arnold!)
- Coupling chemistry with MAM and CAM5 physics (in cesm1.2)
- Prescribed aerosol option (in cesm1.3)
- Diagnostic radiation for any MAM species (in cesm1.3)
- MAM4: primary hydrophobic carbon mode added to MAM3
- Dust speciation, optics, and ice nucleation (Cornell, PNNL)
- Improved aerosol scavenging (H. Wang talk later)
- Superfast in CAM5 (LLNL)
- Implementation of FAST-J photolysis rate computation (DOE funding: M. Prather/P. Cameron-Smith)
- SE/FV dynamical core comparison: on-going tracer tests based on SD configuration
- Specified dynamics in FV and SE (pressure fixer)
- kPP mechanism + master list of chemical reactions
- Box Model or SCAM w/ chemistry
- Fire emissions: of what? (number?) (NCAR., Cornell, PNNL)

# ChemClimWG Development Plan (from Feb meeting 2013 + updates)

- Medium Priority
  - Update SOA mechanism, including VBS (MIT, NCAR, PNNL, LLNL, UM, PSU, NCSU) intercomparison
  - More general aerosol thermodynamics (PNNL, NCSU)
  - Ammonium & nitrate (NCAR)
  - Speciation of POM: hygroscopicity (PNNL)
  - Ion-induced nucleation (SUNY-Albany, PNNL, NCSU)
  - Marine organic sources (NCSU, Harvard, LANL, Scripps, PNNL)
  - Coupled DMS emissions (LANL, ORNL, LLNL, PNNL)
  - Coupling MAM to SNICAR (Flanner & PNNL)
  - MAM volcanic aerosol (NCAR, PNNL)
  - Geoengineering stratosphere, CCN (NCAR, PNNL)
  - Frost flower sources (Scripps, LANL)
  - Conversion of preprocessor to KPP?
  - Vertical resolution
  - WACCM lite? (try to get this going before Breckenridge?)
- Low Priority
  - “Coarse resolution” FV
- Diagnostics
  - Tools for model result differencing
  - Aerosol diagnostic package (PNNL)
  - Benchmark numbers methyl chloroform lifetime, ozone budget terms, methane lifetime, mass-weighted tropospheric OH lightning NO<sub>x</sub>, sf(co/NO<sub>x</sub>/isoprene)



*First Announcement for a SPARC Workshop*

# Stratospheric Sulfur and Its Role in Climate (SSiRC)

28 - 30 October 2013  
Atlanta, Georgia, USA

*Aerosol and, therefore, sulfur play a key role in the climate system. In recognition of their importance, the WCRP's (World Climate Research Programme) SPARC (Stratospheric Processes and their Role in Climate) SSiRC activity is sponsoring a scientific workshop to facilitate an improved understanding on the way that the stratospheric aerosol layer will be affected by on-going climate change and how the stratospheric aerosol layer itself drives climate change.*

*Additional information on the workshop can be found at:*

<http://www.sparc-climate.org/activities/stratospheric-sulfur/>



# CSL Allocation

Experiment	Configuration	# runs	#years per run	hour/yr	total core-hr	Requested	
D.1 Chemistry in CAM-SE	F_1degree_CAM5_STRATTROP	40	2	1600	128000	50	
	F_0.5degree_CAM5_STRATTROP	20	2	6400	256000	25	
	F_0.25degree_CAM5_STRATTROP	10	2	20000	400000	10	
	F_1degree_CAM5_STRATTROP_SE	40	2	1800	144000	50	
	F_0.5degree_CAM5_STRATTROP_SE	20	2	7200	288000	25	
	F_0.25degree_CAM5_STRATTROP_SE	10	2	28800	576000	10	
D.2 Chemistry schemes	F_2degree_CAM5_TROP	40	10	415	166000	50	
D.3 Vertical resolution(100 levels)	F_1degree_CAM5_STRATTROP	10	5	6500	325000		
D.4 Land use/SOA	B_2degree_CAM5_TROP	10	4	500	20000		
	B_1degree_CAM5_TROP	10	1	1660	16600		
D.5 MAM aerosols	multiple resolutions				433000		
D.6 Aviation impact	multiple resolutions				80000		
D.7 Kinetic energy backscatter	F_1degree_CAM5_STRATTROP	1	50	1660	249000		
<b>Total</b>					<b>2832600</b>	<b>3058100</b>	
P.1 1850 Control	B_1degree_CAM5_STRATTROP	1	250	2000	500000	300	
	4xco2 ctrl	B_1degree_CAM5_STRATTROP	1	250	2000	500000	300
	4xco2 ctrl w/ 2100 emissions	B_1degree_CAM5_STRATTROP	1	250	2000	500000	300
	2000 climate/2000 emissions	B_1degree_CAM5_STRATTROP	1	200	2000	400000	300
	2000 climate/2100 emissions	B_1degree_CAM5_STRATTROP	1	100	2000	200000	
	1850-1950	B_1degree_CAM5_STRATTROP	1	100	2000	200000	
P.2 Response to regional forcing	B_2degree_CAM5_TROP	15	100	500	750000	20	
P.3 LGM-CH4	F_1degree_CAM5_STRATTROP	8	30	1660	398400	10	
P.4 Hindcast	F_0.5degree_CAM5_STRATTROP	3	5	20000	300000		
	F_1degree_CAM5_STRATTROP	10	20	1660	332000		
	F_1degree_CAM5_STRATTROP_SD	5	30	3320	498000		
P.6 GeoMIP	B_1degree_CAM4_STRATTROP	1	320	1400	448000		
	B_1degree_CAM4_BGC	1	500	480	240000		
P.7 Land use/SOA	B_2degree_CAM5_TROP	28	10	500	140000		
	B_1degree_CAM5_TROP	6	10	1660	99600		
P.8 MAM aerosols	multiple resolutions				289000		
P.9 Data assimilation	F_2degree_CAM5_TROP	160	1	400	64000		
P.10 Aviation impact	multiple resolutions				250000		
<b>Total</b>					<b>6109000</b>	<b>6958600</b>	



# ChemClimWG Development Plan (from Feb meeting 2013)

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  - Update to MEGAN/include maps when possible (in the release version)
  - Improvements to the dry deposition (Thanks to Maria Val Martin!)
  - Coupling chemistry with MAM and CAM5 physics (in the release version)
  - Superfast in CAM5 (LLNL)
  - SE/FV dynamical core comparison: on-going tracer tests based on SD configuration
  - kPP mechanism + master list of chemical reactions
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  - Fire emissions: of what? (number?)
  - Specified dynamics in FV and SE (pressure fixer)
- Medium Priority
  - Update SOA mechanism: Colette Heald's SOA in the release version (additional work by K. Barsanti); link with MAM
  - VBS modeling of SOA (separate from MOZART)
  - Conversion of preprocessor to KPP?
  - Vertical resolution
  - WACCM lite? (try to get this going before Breckenridge?)
- Low Priority
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- Diagnostics:
  - Tools for model result differencing
  - Benchmark numbers: methyl chloroform lifetime ozone budget terms, methane lifetime, mass-weighted tropospheric OH, lightning NO<sub>x</sub>, sf(co/nox/isoprene)

