

**GEOS-Chem Steering Committee Telecon
October 4, 2012 10-11:30 Eastern**

Attending: Daniel Jacob, Bob Yantosca, Randall Martin, Dylan Millet, Loretta Mickley, Noelle Selin, Colette Heald, Prasad Khasibhatla, Ray Nassar, Hong Liao, Jun Wang, Daven Henze, Paul Palmer, Jeff Pierce, Jinqi Mao, Mat Evans, Jeff Pierce, Lyatt Jaegle, Steven Pawson

Absent: Kevin Bowman, Yuxuan Wang, Dylan Jones

1. Release of 9-1-3, update of model credits (Daniel)

- Some challenges with Br chemistry initially. Now addressed and the Br chemistry is an option (only one chemical mechanism, but turn off the emissions).
- Model narrative and credit page have been updated
- Now porting v9.01.03 to NASA machines (MPI) to test there as well – exciting development! Working towards MPI compliant GEOS-Chem as a result of ESMF-compliance (emissions, chemistry, deposition compliant with an online model). Longer for transport to be parallelized with MPI for offline model. Mat Evans to follow up on UK funding to make transport MPI-compliant. Steven Pawson indicated that GMAO also looking at MPI-compliant transport code as well.
- V9.01.03 is running 75-80% slower on Prasad's machines: suggesting that release do-loop fix as a patch to v9.01.03 (rather than wait for v9.02). There may also be some clean-up in mechanism files, etc. to speed up. Ray Nassar also reported ~50% slow down with 1-tracer CO2 simulation.

2. Future directions for GC (Daniel)

- Prompted by email from Mat regarding the future of the online vs. offline model. Daniel sent his ACMAP proposal for the GEOS-Chem Support Team to the Steering Committee which argued that a vigorous offline model community is necessary to sustain the state of the science in the online model.

3. GMAO news (Steven)

- Getting ready for putting GEOS 5.9.0 into production (not too different from 5.7.2, but observational operators involved). Shouldn't be too much change in products. Cube sphere grid implemented in 5.9.0 but not in operational version. Eventually when there is use of cube sphere will still produce lat/lon output products for the community.
- Started working on approximations when running at 0.25 transport
- New GMAO postdoc looking at the definition of the PBL height, has come up with a means of addressing this which also feeds back on convection. Currently testing. Not likely in 5.9.0 but in next release.
- No time horizon about GEOS 6 (or will it be GEOS 5.10?). GEOS 6: 10 km resolution non-hydrostatic core. GEOS 5 looking at new assimilation approach (4D VAR).
- GEOS 5.2.0 to be turned off soon. So GEOS-Chem will switch to GEOS 5-FP soon. With regards to nested grid: currently GC runs so slow with 0.25 that the plan is to maintain a 0.5 product for nested simulations.

4. New GCST member Sajeep Philip (Randall)

- Matt Cooper moving on to PhD and so no longer appropriate to continue on Support Team
- Sajeep Philip has agreed to take on this role. Has worked with Randall for 3 years. One priority is continuing to produce nested grid met fields for multiple regions. The cost of cutting one region or two is similar in terms of time/computational efforts. The only concern is storage. Discussing storage options with Mat Evans. So anyone interested in adding a new region could contact Dalhousie. Would be expensive to go back in time, but any forward processing could easily include additional nested regions.

5. Model engineer's report (Bob)

- Sent out a copy of report to Steering Committee
- Next version: v9.02, note numbering change since all public releases
- Grid independent code: initial hand-off in May/June on NASA machine. Can compile it with GEOS-5 GCM. Preparing some input files to run a simulation.
- Christoph Keller working on new emissions module esp data structures. In discussion with Dalhousie and others about emissions updates.
- Discussion of chemical mechanism with KPP (Mat)
- RRTMG integration in GEOS-Chem (Colette)
- Issue with OH in TOMAS (Jeff)

6. Model adjoint updates (Daven)

- Lots of updates to adjoint in last few months, bringing updates from forward code. Hired new programmer to keep the model up to date and moving repository to git.
- Additional features: improved estimates of posterior error covariance, and tracking updates online on the wiki
- Nested model adjoint with full-chemistry: a few groups working with this (U Colorado, Toronto) → but requires lots of memory if use the full standard nested domains (Daven's group using only the US)

7. Benchmarking the nested model (Jun)

- Making good progress, but some delays: testing with new supercomputer (ifort12 wouldn't work with nested grid, but ifort11 works).
- Benchmarking of other versions of the code (CO₂, CH₄, etc) → up to the working groups to verify that these are benchmarked

8. Time step issues (Randall)

- Wiki recommends chemical timestep that is twice the transport timestep (suggests a 30 min chemical timestep, with a transport timestep for 2x2.5 is 15 min). Randall suggesting going back to recommending 60 min.
- Colette mentioned that they reported SOA simulation errors with 60 min chemical timestep at 2x2.5 (v9.01.02) to the Support Team – will follow up offline with Randall.
- Mauricio at Harvard has been investigating this and apparently model error dominated by resolution not by timestep.
- Why do we use 15 min for 2x2.5 and 10 min for nested? 10 min seems fine for nested (based on Courant). Is there an opportunity to relax the timestep on 2x2.5? Needs to be investigated. Don't want large parts of the world to switch to semi-Lagrangian (if breach Courant condition) – mass is not conserved. Randall's group will continue to investigate.

9. KPP issues (Prasad)

- V9.01.03 out of the box with KPP failed, ran fine with SMVGEAR. Has never successfully run a long simulation with KPP.
- Mat is investigating whether KPP is system-dependent, or if there are convergence criteria.
- Daven did initial testing awhile back with v7. Found similar results with KPP and SMVGEAR, but a little faster. When chemistry not converging should skip it and move on. But possibly if fails too many times then the code will crash.
- Justification for KPP? Only slightly faster (or more accurate), no inherent reason that more robust, but just a larger community of users.
- More investigation required on this issue.

10. Radiative forcing calculations in GEOS-Chem (Loretta)

- RRTMG (AER) code: 2 groups successfully implemented this. Fangqun Yu's group at SUNY Albany has implemented shortwave for APM and ready to submit back to Harvard. Colette Heald, Steven Barrett and Matt Alvarado have implemented longwave/shortwave and currently testing. Ready to submit in 6 months, likely available by the GEOS-Chem User's Meeting. Once ready to submit then we can harmonize and put into standard code with high priority.
- Other groups working with RT codes: Daven (LIDORT in adjoint), Jun (offline scheme). As other schemes become available could be options.
- AER-MIT integration of RRTMG: initial steps complete, now working on optimizing the timing (factor of 3 increase in run time – will easily get to factor of 2, looking at more speed-ups), and investigating the robustness of the aerosol calculations (at 61 wavelengths).
- Adoption of RRTMG should not preclude development of other RT code in the science community.

11. Mirror GEOS data site at York (Mat)

- Mat is presently working with Randall and with Jack Yatteau to set up a mirror GEOS-5 data site at York

12. Working Group updates:

- a. Chemistry (Jingqiu)
 - HO₂ uptake paper is now submitted to ACPD, waiting on publication for integration in the standard code. But available for those who would like it (substantial differences)
 - Updates on nighttime isoprene chemistry: Jingqiu, Fabien, Mat
- b. Aerosols (Jeff)
 - Problem with OH in TOMAS → discuss more offline

13. Features to include in 9.2 (Daniel + all)

- Soil NO_x emissions (Randall's group, Rynda and then Harvard)
- Chemistry updates could be lumped into release – discuss offline with Jinqiu and Mat
- N₂O₅ inhibition by aerosol nitrate ready to go (model not hugely sensitive)
- Isoprene chemistry in standard model: switch to Paulot chemistry and separately benchmark (check for high ozone?)

- 0.25 resolution capability
- All the emissions updates: straight-forward (NH₃, scale factors, Asian emission inventory, nested gridded emissions) → maybe some concern that scale factors for the US aren't sensible (CO is not following CO₂ trend), so some investigation required?
- Hg issues lumped into one release (NEI, future scenarios, oxidation, Streets): high priority with upcoming field campaign
- PBL fix: immediate priority
- Optics fix: important
- SOA expanded: as an option for now (in future need a discussion of SOA)
- Cloudwater pH for sulfate
- Acid uptake on dust: Mat and Yuxuan identified user groups, so should be included
- RCP scenarios: easy to implement, users interested
- Interannual lightning: ready to go
- Priority list will be put together with some suggestions for lumping, and circulate to Steering Committee for feedback
- Spacing releases out ~ 6-9 months, which does mean less of a burden on the community to update, but plan for v9.2 to be released next spring.

14. GEOS-Chem Meeting

- Fund-raising going well in the US, some support in the UK and China, Randall has made request in Canada. Same room booked at Harvard so will limit attendance to 180 but will broadcast on the web, so should help.
- Plan to spend January telecon on the meeting.