GEOS-Chem Steering Committee Telecon
11 September 2018

Attending/Missing**:**
Becky Alexander, Kevin Bowman, **Sebastian Eastham**, Mathew Evans, **Emily Fischer**, **Jenny Fisher**, **Jeff Geddes**, Colette Heald, **Barron Henderson**, **Daven Henze**, **Chris Holmes**, **Lu Hu**, **Daniel Jacob**, **Dylan Jones**, **Prasad Kasibhatla**, **Christoph Keller**, Hong Liao, **Jintai Lin**, **Hongyu Liu**, **Jingqiu Mao**, **Eloise Marais**, **Randall Martin**, **Dylan Millet**, **Andrea Molod**, **Lee Murray**, **Jeff Pierce**, Amos Tai, Jun Wang, **Yuxuan Wang, Bob Yantosca**, **Fangqun Yu**, **Lin Zhang**, **Lizzie Lundgren**, **Melissa Sulprizio**

1. **General update – report from NCAR meeting (Daniel)**
    - Released version 12.0, working on 12.1
    - NCAR meeting at end of July
        - significant interest from NCAR in working with GEOS-Chem community (identified as strategic priority)
        - GEOS-Chem coupled with GEOS, BCC – but they are not open access
        - Opportunity to work with CESM (climate), WRF (high res), both open access
        - Already have prototypes for both through May Fu (WRF) and Seb Eastham (CESM)
        - At same time, NCAR moving to next generation "SingleTrack" model that will do everything (replace WRF and CESM, different resolutions, swap out modules) – just starting and interested in having GEOS-Chem be a part of this
        - We are proceeding in working with NCAR in developing these online modular capabilities while remaining committed to keeping GEOS-Chem unified through the default/classic version; first priority is maintaining an easy-access model that the atmospheric chemistry wants to use (in terms of both science and software engineering)
        - May Fu will join the steering committee as WRF-GC scientist when it is mature (expected at time of IGC9)

2. **Engineer's report (Bob)**
    - Now all release candidates have a doi, plus there is a specific doi for the current version
    - 12.0.1 had some minor fixes
    - 7 day timing tests run with ifort and gfortran
    - New submission guidelines now posted to facilitate proper implementation
    - 12.1 will have first stage of flexgrid (using HEMCO to read met fields); second stage coming later
    - Moving unit conversions to HEMCO Config file to make them more explicit
    - 12.1 will have tendencies associated with different operators to be able to figure out contributions of emissions, etc. to budgets
    - Now have a tool that will do some testing every time a commit is pushed to the repository
    - Structural updates to GEOS-Chem coming for integration with WRF
    - Will soon start moving benchmark code from IDL to Python
    - Cloud capability is now mature, can run GEOS-Chem on a single node on the cloud; looking for volunteers to test it

3. **GMAO Update (Andrea, Christoph)**
    - Have now internally worked out ways to test medium to long-range transport before a new FP system is released (lower resolution, lots of tracers, 1 year)
    - Prototype test has shown some issues in latest FP
    - Future versions will have this done before an FP is released.

- Same tracers are going into GEOS-Chem 12.2 so we'll be able to compare
- Have also been comparing GMI and GEOS-Chem wet scavenging. Some differences especially more efficient HNO3 scavenging in GMI. With GEOS-Chem there is accumulation of NOy in stratosphere. This is the only remaining issue in the stratospheric comparison between GEOS-Chem and GMI – otherwise they agree well.

4. Working Group Reports

- **Adjoint model and data assimilation (Daven,** Jun**)**
  - Released version 35n; had some bug fixes esp. for nested simulations
  - Guillaume (student working with Seb) working on adjoint of MERRA2/GEOS-FP convection (had been reverting back to older version of convection)

- **Emissions and Deposition (Emily, Jintai, Eloise, Dylan M.)**
  - Jintai's group developing native resolution global biogenic, soil NOx, and seasalt emissions. Time resolution will be hourly (in monthly files). Have done some comparisons with 4x5, very happy with results so far.
  - For now, this will be optional; user can choose to choose online or offline calculations (each has pros and cons).
  - Will need to be careful as we move to coupling with GCMs (so that emissions can be calculated at GCM resolution as needed).
  - For CESM, the plan would be to use the land model to calculate the emissions (not GEOS-Chem).
  - Other offline emissions (lightning NOx, dust) have had code provided, close to ready to integrate. Just need to run the dust simulation.
  - Offline emissions also provide a nice reference when running in different configurations.
  - CEDS emissions will be new default from 12.1

- **Chemistry (**Mat**, Barron, Lu, Jingqiu)**
  - Nothing to report

- **Aerosols (**Colette**, Jeff, Becky, Fangqun)**
  - Randall's group is leading an update to hygroscopic growth (will now use kappa Koehler theory, calculated for each species). Paper is in ACPD right now; will wait for acceptance in ACP before bringing into GEOS-Chem. To be added to model development priorities (< 6 months)
  - Issues with nitrate being too high
    - relative to IMPROVE (US) in v12 and in some older versions. For US, could be issue with NEI11 NOx emissions.
    - Jintai found nitrate is also very high in China in v11-01, have done some tests and doesn't look like it is due to NH3 emissions.
    - Fanqun looking into cloud processing.
    - Daven has found that implementing diurnal variability of NH3 emissions (without changing magnitude) brings some of the nitrate bias down (note this requires some pre-processing of emissions).
    - Lyatt's group: some work about dry deposition of nitric acid (based on WINTER campaign). Also an update to N2O5 uptake that makes a difference.
    - Randall's group: dry deposition of NO2 can also play a role.
    - Chris has looked at related heterogeneous processes, paper about to be submitted, will be added to model development priorities (<6 months).

- **Carbon Cycle (**Kevin**, Dylan J.)**
  - Andy Jacobson (NOAA) has some code to sample model at locations & times that are part of new ObsPack framework NOAA using to store GHG data. Would like to have this code incorporated into the standard version of GEOS-Chem.
  - In longer term, could expect to get other data (not just NOAA) in this format. NOAA would like it to become a standard.
  - Could be useful for updates to benchmark as well because NOAA provide CO (and maybe O3?), and we want to update these data anyhow
  - Seb also looking into robust way to extract data in a similar fashion to design a solution for GCHP.
  - General GCSC support – will try to get this into v12.2

- **Hg and POPs (Jenny, Chris)**
  - Nothing to report

- **Chemistry-Ecosystems-Climate (**Amos, Hong**, Lee, Jeff)**
  - Nothing to report

- **Transport (Hongyu, Andrea)**
  - Status of implementing Karen Yu's RAS code for rediagnosing convection: Bob has it in a branch; compiles and runs now but not yet sure whether it is producing good output. Not quite working with GCHP yet but no reason it shouldn't.
  - Jintai + Chris has a fix for the mass conservation for non-local boundary layer mixing scheme – both schemes now conserve mass. This is going into 12.1.

5. Nested model updates (Yuxuan, Lin)

- Some discussion about default timestep for running with MERRA2 (was 5min/10min) – now recommending 10min/20min to speed up. Now in 12.0.0. This is just for MERRA2; not for GEOS-FP (because at a higher resolution than MERRA2).
- 2-way coupling capability has a bug, now fixed in 12.0.0.

6. GCHP updates (Seb, Randall)

- Ongoing work running GCHP using test archive of mass fluxes from GEOS. There are still some surface pressure differences, probably due to differences in wet vs dry transport. Still trying to solve this.
- Now working with gfortran compilation. Transport much slower, makes a 5% slowdown overall, looking at compile flags
- Updating MAPL with parallelized I/O, will solve the problem of input becoming computationally limiting for large # of cores
- Working on planeflight-style diagnostics package; Randall working on a local time diagnostic (similar to existing).
- People have started running GCHP with specialty simulations; would be good to share these run directories with GCST.
- Build system is more complicated than GEOS-Chem classic, Randall's group has plans to update this with cmake to make it more user friendly (but would be optional).
- GCHP will exist in parallel with GC-Classic and there is no plan to retire GC-Classic in any kind of foreseeable future. It is expected to remain the workhorse for much of the GC community and it remains only option for nested model simulations

- Proposal to use different version numbering for GCHP to facilitate keeping track of updates that don't affect GC-Classic and vice versa. However the prevailing view of GCSC is that we should keep a single version number, for several reasons:
    - Not really a problem that we update GEOS-Chem version number for every GCHP update even if it doesn't affect Classic – we already do this with structural updates, specialty sim updates, etc.
    - It may be a problem for non-GC community to see two versions of something called "GEOS-Chem"
    - In any case, unless GCC will be interoperable with different GCHP verisons, we'd already have one set of numbers anyway
    - Will reduce confusion for users (and non-users) to have just one version number

7. Benchmarking (Mat**, Daniel)**

- Mat not here to discuss
- Will be a big improvement
- Would be nice to update ozonesonde data to be more contemporaneous (Lu planning to do this with his new ozonesonde data, but doesn't expect much change)
- Benchmark is presently for GC-Classic (UCX) only. GCHP is not formally benchmarked but sanity checks are done by the GCST to ensure consistency with GC-Classic. No plan to release GCHP benchmarks to the Steering Committee to avoid overburdening. GC-Classic UCX can remain the benchmarked standard for now.
- Need to add ATom to the benchmarks. Some discussion as to whether we should update annual benchmark year to 2017 to match timing of two ATom campaigns, but generally we don't worry about interannual variability in the benchmarks. Also, FP changed in Feb 2017 and could cause meteorological hiccup (but we could switch to MERRA-2). Some emission inventories are missing for 2017 including GFED. Table for now.
- Would be good to also include other more recent aircraft campaign near source regions in the benchmark.
- Could we include satellite NO2 diagnostic in benchmark? Relatively mature, useful for surface sources. But would complicate things by needing to deal with air mass factor.
- Some discussion at NCAR meeting about using NCAR benchmark code. They have a nice interface but only look at a few species. Maybe an opportunity for the future.

8. Updates on GEOS5-GC comparisons to GMI and GOCART (Christoph)

- Stratospheric comparison with GMI looks really good other than NOy, still working on NOy.
- Transporting families for chlorine and bromine improves the stratosphere; has been implemented in GEOS5-GC system and will be communicated back to GEOS-Chem (<6 months).
- Comparison with GOCART: seasalt emissions are quite different (but understand why, GOCART was not implemented correctly). Not much to report at this point.

9. IGC9 planning (Daniel)

- May 6-9, clinics will be Sunday May 5th (afternoon)
- Have a website, registration page will go up in September
- Daniel has been contacting agencies for support; NASA and NSF have been supportive and proposals will go in. HUCE, MIT, EPRI will contribute. Looks like there will be the same amount of support as in past meetings (which has been sufficient)

10. GEOS-Chem logo (Daniel)

- GCSC support for going to a graphic designer

- Jeff G. has offered to lead this – will come back to us

11. How does Slack work? (Daniel)

- Suggestion to start conversations via email, then when flurry of responses move to Slack (or if we expect a lot of responses start with email then straight to Slack)
- Would be especially useful for benchmark conversations