GEOS-Chem Steering Committee Telecon
22 February 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**, **Lizzie Lundgren**, **Jingqiu Mao**, **Eloise Marais**, **Randall Martin**, Dylan Millet, **Andrea Molod**, **Lee Murray**, Jeff Pierce, **Melissa Sulprizio**, **Amos Tai**, Jun Wang, **Yuxuan Wang**, **Bob Yantosca**, **Fangqun Yu**, Lin Zhang

1. **General Update (Daniel)**
    - Wrapping up v11-02 – provisional release end of March (on track)
    - Lots of bugs found in v11-02d (some older); still some small bugs in halogens & SOA that will be fixed in v11-02e (basically ready, benchmarks to start next week)
    - v11-02f: emission updates including new NEI
    - netcdf + bpch diagnostics
    - GCHP will be fully functional (minus a few diagnostic issues)
    - Priorities for v11-03 – next telecon
    - GEOS-Chem on the cloud going to happen; have an agreement for free hosting on Amazon Web Services
    - Looking ahead – will try to speed up the chemistry (important issues for GEOS-Chem within GEOS-5 system). We benchmark UCX, but almost everyone actually uses Tropchem. Would be nice to retire Tropchem at some point, but first need to speed up UCX.
    - Grid-independent emissions to go into v11-03, as soon as ready. Important for ensuring consistency across resolutions.
    - Updating model development page – only do at public releases, but people use interim releases. Will now provide the updates to the page at every internal/checkpoint release. Also some problems with the way emission inventories are referred to (e.g. NEI as implemented by *reference from G-C community*) – difficult to find original papers, and important to give credit to those who put into GEOS-Chem.

2. **Engineer's Report (Bob)**
    - 11-02f: adding a 1-year GC classic 2016 benchmark (in addition to 2013) because we now have a full year of 0.25° met for GCHP for 2016 – better comparison. We will move to 2016 for future benchmarking.
    - Hg updates should go in, waiting for last updates from Colin.
    - All netcdf diagnostics needed for benchmarking are updated; some specialized diagnostics won't make it into v11-02
    - GCPy benchmarking isn't fully operational/user-friendly yet.
    - Unit tester with v11-02 will have all input files needed to schedule netcdf, emission diagnostics with full set that are possible for that simulation but user can modify
    - Flux diagnostics will wait until v11-03
    - Time steps changing to seconds rather than minutes.
    - Will be setting up some timing tests with different compilers, cores, etc.
    - Q: have emission inventories caught up to 2016? A: no, HEMCO will take the most recent year by default.

- Q: Change to 2016 benchmark means a change to FP system – substantial change – how will we check? A: running exact same simulation for 2013 and 2016 – only change will be the met, so this should show us the differences.

3. **GMAO Update (Andrea, Christoph)**
    - Wondering whether GMAO should look at impacts of update to FP system on GEOS-Chem. If it impacts GEOS-Chem too much, it could be a feedback loop to FP system. Right now there is too much of a delay between FP changes and use by GEOS-Chem community. Some recent big changes to FP that may have big impacts on GEOS-Chem.
    - GMAO runs parallel systems for e.g. a summer month and a winter month. Those are the outputs that get scrutiny, and this is where it would be good to have something short that benchmarks impacts on GEOS-Chem. Tracers online only practical if we use a really small number of those tracers, and only for parallel system.
    - Substantial changes to water vapour, clouds, etc. might not show up with tracers – would be better to benchmark offline. Need the GCSC to see these and scrutinize.
    - Ongoing evaluation & comparison of stratospheric chemistry mechanism with GMI. Small differences in NOy are being investigated.

4. **Working Group Reports**
    - **Adjoint model and data assimilation (Daven)**
        - No major updates. Some progress on observation operators, UCX adjoint.
        - Working towards data assimilation with GCHP, but still on learning curve to figure this out.

    - **Chemistry (Mat, Lu, Jingqiu)**
        - Working on comparing halogens in v11-02d with what was published.
        - Also working out a few issues with the monoterpene chemistry (overlap between "total monoterpenes" and individual/lumped species).
        - Halogens should be the default going forward, still trying to understand how other changes to the model are affecting the outcomes (ocean acetaldehyde, HOBr + S(IV) both are decreasing the bromine). With these changes, actually less of an overall change from prior versions of GEOS-Chem than expected from the papers.
        - Q: has this been tested with seasalt debromination off? A: comparing like-for-like, so this is still turned off for the moment. Harvard currently testing whether turning debromination back on will help with bromine (we think it makes sense to do so).
        - Halogen chemistry does have an impact on sulfate over the ocean.

    - **Aerosols (Colette, Becky, Fangqun)**
        - Nothing new to report beyond the v11-02d and v11-02e list of changes.

    - **Carbon Cycle**
        - GCHP CO2 simulation running at present.
        - Updated CH4 simulation will go into v11-02.

    - **Hg and POPs (Jenny, Chris)**
        - Hg updates in v11-02 now match Hannah's paper, will go in before public release.
        - Colin will put mercury chemistry into KPP for v11-03– much easier to update in the future.

    - **Chemistry-Ecosystems-Climate (Amos, Lee, Jeff)**

- Skype side-call to take place before next telecon for different groups working on different components of dry deposition – contact Amos to take part.

- **Transport (Hongyu, Andrea)**
  - At last IGC, decided to make uniform set of tracers that could be included in runs to more easily compare transport. Bob has suggested it would not be hard to implement and people could choose whether or not to include. Also do-able in GCHP. Q: is it useful enough / would people run with them?
  - Likely few would run in full chemistry, but could be included in run of Rn-Pb-Be simulation. Would be nice to have them for benchmarks, however.
  - Could easily just drop into radon simulation (except age of air – a bit more work, but do-able). Better to include in radon than in full chem. Especially as some of these need 6-12 months of spin-up to be useful.
  - Even if GMAO includes the on-line tracers in the GEOS system, we would want to run them in GEOS-Chem anyway to make sure the offline model isn't corrupted.
  - We should just add this to our benchmarking procedures. Could eventually be useful for research purposes (e.g. what fraction last touched surface over Europe vs. Asia, etc.).
  - Agreement that these tracers will be added to v11-03.

- **Emissions and Deposition (Emily, Jintai, Eloise)**
  - Updated NEIv11-EK (6.2) has been passed to GCST. This will lower the NOx emissions for the U.S. and is also probably the best choice for ethane and propane. Still not sure what to do for ALK4.
  - Q: Will v11-02f benchmarking be able to output regional emission totals for developers to check? A: not currently something we are doing. Christoph suggest that via HEMCO could probably set up benchmark diagnostics for each regional inventory and sum them to get regional totals.

5. **Nested model updates (Yuxuan)**
   - Nothing major to report.
   - Q: do we have regional mask files to look at countries more accurately? A: yes – have higher resolution mask files for each country/region. Christoph also has a mask file for all countries.

6. **GCHP updates (Randall, Seb)**
   - Continues to be up-to-date with GC classic. Close collaboration with GMAO has really benefited.
   - First GCHP publication from Seb (model description) about to be submitted to GMD.
   - Have run a global 0.5° full chemistry simulation for a month in ~24 hours (540 cores). Haven't observed any limit in terms of scalability or number of cores that can be used. No reason to think it would reach a plateau.
   - Nearly all diagnostics are now in GCHP.
   - JPL running GCHP CO2 simulation.
   - MAPL updates helping (and/or expected to help) with I/O issues.
   - We are not planning on GCHP replacing GEOS-Chem classic anytime soon – instead will be an additional resource in the GEOS-Chem package.

7. **GEOS-Chem as a chemical component of CESM (Seb)**
   - Have started integration into CESM-2. Plan is to have this working, at least for demonstration purposes, by end of May (NCAR hosting a meeting for NSF projects).
   - Code in CESM will be identical to code in GEOS-Chem classic.

- Q: will that include aerosols? A: aerosol coupling will be quick & dirty for demonstration in May, but correctly coupling this likely to become a focus after May.

8. **Status of grid-independent emissions (Randall)**
    - Lee has lightning flash rates for entire MERRA-2 & GEOS-FP (3-hourly, matches met fields)
    - Dave Ridley has hourly offline dust emissions, delivered to GCST (working on GEOS-FP)
    - Jintai Lin's group continuing to work on seasalt & biogenics (hourly)
    - All three will go into v11-03 (rather than delay v11-02 release)
    - Q: how will we handle bi-directional biogenic emissions (ammonia, aldehydes?)? A: haven't gotten that far yet.

9. **Speeding up the chemistry in UCX (Daniel)**
    - Mike Long has been working on this, but leaving at end of the month
    - Trying to do separation of mechanisms between troposphere & stratosphere, especially not doing any NMVOC chemistry in the stratosphere, seems to be working
    - Will be passed onto Jiawei Zhuang
    - Mat and Christoph working on a machine-learning algorithm, Christoph has implemented it successfully in the GEOS system – but wouldn't replace chemical mechanism, just use for forecasts

10. **GEOS-Chem on the AWS cloud (Daniel)**
    - Will host GEOS-FP and MERRA-2 data for free, will be available for download by GEOS-Chem community (but that part probably not free)
    - Initial focus on GEOS-Chem Classic
    - Advantages: ease of use for occasional users, reproducibility of the model (executable on the cloud that can be run, used for publishing)
    - Further updates at next telecon

11. **GEOS-Chem Asia meeting (Hong, Daniel)**
    - Plans proceeding, registration deadline March 1st.
    - Will have working group meetings, but not official working group meetings.
    - Provides an opportunity for people who can't travel to US.

12. **Other – default met fields to recommend for users (Lee)**
    - Should we be making a recommendation that average GC user should be using MERRA-2 rather than GEOS-FP? (stability, trend studies), etc. GMAO agrees.
    - Is there a place in the manual where we make these recommendations? Mostly points to wiki but we could do that.
    - In that case, should we also be benchmarking with MERRA-2 instead?
    - What about GCHP benchmarks with GEOS-FP and Classic with MERRA-2. GCHP will be pushing the resolution, so would be a shame to lose resolution. But that would make it harder to compare GCHP to GEOS-Chem classic.
    - Benchmarks are designed to see how model versions compare, so can't we just use GEOS-FP for that? But if developers work in MERRA-2, then will make it harder to compare benchmarks to publications.
    - Perhaps could do spot-checks, like we do with UCX and tropchem.