

**GEOS-Chem Steering Committee Telecon
4 June 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**

1. General Update (Daniel)

- Emissions for v11-02: Christoph has compiled a list of all emissions & scale factors being used in standard simulation, will be on wiki soon. GCSC members should check that they are happy with it and that there are no double-counting or other errors. Found & fixed one issue with propane (double-counting with both Xiao and CEDS). Will maintain this spreadsheet going forward.

2. Engineer's Report (Bob, Lizzie)

- GCA1 meeting presentations will be posted soon
- v11-02 release candidate: 1-yr benchmark re-run and plots will be posted. Will be released as soon as documentation is complete.
- Model development priorities page is updated, will provide basis for the next version.
- Jiawei has GC Classic and GCHP running on the Amazon cloud. For a quick simulation, only costs a few cents to run. All v11-02 data is already on the cloud.
 - Students can get a \$100 credit to run on Amazon cloud for free. Any country? Not sure.
 - Need to make sure we publicize, especially to occasional users who might not otherwise use GEOS-Chem
- Jiawei is also installing a Singularity container that will allow exporting entire configuration without worrying about different compilers, libraries, etc.
- GCHP up to date with v11-02e, testing v11-02f & release candidate. Will have a few extra features: offline native resolution dust emissions, lightning emissions
- Dust emissions will go into v11.3 for GC Classic
- Ongoing collaboration with GMAO for better development pipeline for GCHP to reduce MAPL code, make MAPL more useful
- Propose new versioning protocol that more closely reflects industry standard and is based on semantic versioning – see details in GCST Report
 - Could make the major number = year. But issues with that including making earlier versions (e.g. v11) look really old. Also confusing if you are running e.g. GEOS-Chem 2018 for year 2015. Might confuse readers/reviewers/editors outside the community
 - Want to move away from “public release” – interim versions are already public, it will just be an update to the manual at the public release. Narrative, etc. will be updated for each minor release.
 - Is there any way to distinguish between 1-year and 1-month benchmark? Maybe a 4-number system. Seems like a lot of numbers, but also often bugs aren't found until the 1-year benchmark.
 - For now, let's go ahead with suggestion from support team

3. GMAO Update (Andrea, Christoph)

- Still validating UCX in GEOS-5. Seeing buildup of Bry in stratosphere. Would be good to get GEOS-Chem community more involved in this procedure. Monthly telecon amongst UCX users/developers? Seb & Dylan Jones to get involved.
- Transport of species vs families. In stratosphere getting purely numerical build-up of Bry, chlorine. GMI tackles this using families – thinking of implementing something similar in GEOS5. Should also improve performance with fewer advected species. Is GEOS-Chem community interested in doing the same? Would develop in GEOS5 system but then potentially pass on to GEOS-Chem.
 - Q: Would we have to do it in both trop & strat? A: shouldn't really affect the tropospheric chemistry results
 - Seems like if it would not be detrimental, it should get added to the standard GEOS-Chem
- NOy heterogeneous chem – some changes have been made to the GEOS-Chem version within GEOS-5 in order to facilitate comparison with GMI but don't need to go into standard GEOS-Chem.
- Q: Progress on cubed sphere? A: plan is always next release of forward processing version. Imminent release of a new FP version, but doesn't seem to have change in standard output yet. So not sure. Andrea to check. Some substantial impacts on transport upcoming in this version. Will be worth running some tracer transport experiments to test implications.

4. Working Group Reports

- **Adjoint model and data assimilation (Daven, Jun)**
 - Nothing to report
- **Chemistry (Mat, Barron, Lu, Jingqiu)**
 - Still looking into stability of the solver under different conditions. Some trouble with tolerances under certain conditions. Quick fix is to reduce tolerances. Longer term: level of tolerance needs to be more carefully resolved.
- **Aerosols (Colette, Jeff, Becky, Fangqun)**
 - Becky's group planning to give seasalt alkalinity tracers to GCST working from v11-02d (previously supplied in v9)
- **Carbon Cycle (Kevin, Dylan J.)**
 - Bottom-up fluxes for CO2 simulation. Getting suite of fluxes to provide to community so users have more options. Kevin will contact GCST about these to get them implemented into standard code (next week)
 - Transport item. GEOS-Chem & TM5 comparison using SF6 – Andrew Schuh submitting paper that highlights transport issues in GEOS-Chem at mid to high latitudes. Andy Jacobson running an SF6 model intercomparison. Dylan J's group will run with GCHP to contribute to this.
- **Hg and POPs (Jenny, Chris)**
 - Nothing to report
- **Chemistry-Ecosystems-Climate (Amos, Hong, Lee, Jeff)**
 - Had side meeting about dry deposition last month
 - Two observational datasets that can be used for ozone dry deposition: Chris Holmes' group; Sam Silva from Colette Heald's group. Both can be used for model-obs comparisons for validating dry deposition.
 - Chris has found some bugs in implementation of current Wesely scheme in GEOS-Chem.

- Also some updates for dry deposition at cold temperatures.
- Plan to link dry deposition & biogenic emissions directly to photosynthesis, still in development.
- **Transport (Hongyu, Andrea)**
 - Q: When will Karen Yu's code updates around re-diagnosed convection go in? Will start after v11-02 public release; within next few months. Lots of interest, but will need testing and optimization. Someone at GMAO tried to implement it and may have found a bug; Andrea to follow-up.
- **Emissions and Deposition (Emily, Jintai, Eloise, Dylan M.)**
 - Isoprene emissions continue to decline. Our global total is half Alex Guenther's bottom-up estimate, also on the low end of top down. Not recommending any changes at the moment, but people should be aware.
 - Does change at resolution – higher at high resolution.
 - Bug fixes in southern hemisphere MEGAN emissions; updated plant functional type distributions at nominally ~2x resolution (closer to nested resolution) – recommend putting into standard code
 - Jenny has updates to MODIS LAI based on Yuan et al. (2011) BNU product which allows us to use a consistent product from 2005-2016. Barron did some initial validation in GEOS-Chem – but this version hasn't been tested in GEOS-Chem (perhaps could be done via benchmarking?). Requires a bit of code re-structure to ingest via HEMCO.
 - MEGANv3 – Jen Kaiser is implementing in GEOS-Chem.
 - Ammonia emissions – is anyone working on updating natural emissions, and if so can that be added to working group page? Fabien has ocean emissions, somewhere in to-do list. Not compatible with HEMCO...
 - Biomass burning injection heights – Emily's group has submitted GMD paper. BB injection height based on 2008 MISR monthly climatology by region. Can make a big difference esp. at high latitudes. It's in the code now. Just for 2008, but in a lot of places there is very low interannual variability according to Maria val Martin & Ralph Kahn who are working on a paper about this now. Not good for small fires (e.g. ag fires over SE US, prescribed fires). Recommendation to include as option but not default.

5. Nested model updates (Yuxuan, Lin)

- GCA1 – good discussion. Users interested in South America + Africa + Atlantic nest developed by Qiaoqiao Wang (GEOS-FP at 0.25°).
- Users want ability to use smaller domain within larger nested domain, this can be done with a new method by Lin Zhang to change the buffer zone. Lin's approach is straightforward for users to implement now – improves speed via transport & chemistry but fields still read/regridded on larger domain. Will be publicized through wiki.
- 1/8° coming, but community still happy with 0.25° for now.

6. GCHP updates (Seb, Randall)

- Ongoing work to sort out some issues with Courant numbers; planning to finish validation shortly.
- Lizzie working on incorporating version-controlled MAPL. Should reduce IO time which has been bottleneck, also using safer method to reduce memory. Currently large memory overhead, GMAO has a solution. Bad news: will require ifort17.
- Current version can be compiled with gfortran. Everything but transport runs at same speed with gnu relative to intel compilers. Slower transport should be fixable.

- Jiawei from Harvard has run GCHP on single node on Amazon cloud. More development needed to parallelize across multiple nodes on cloud.
- GCHP usage continues to grow.

7. Guidance to developers for code submission (Randall)

- Would like developers to:
 - include more documentation on expected results, e.g. regional and global totals for new emission inventories
 - include more explicit guidance for implementation
- Details to be added to the wiki

8. Status of grid-independent emissions (Randall)

- Dave Ridley's dust dataset updated & delivered
- Lee Murray has completed initial lightning NO_x dataset, noticed some issues so re-running
- Jintai Lin's group has made progress on biogenic VOCs, seasalt, soil NO_x (not fully grid independent because of deposition term, but this is only ~5%) – expect delivery in time for one of first releases in the next version.

9. GCA1 report (Daniel)

- 115 participants, many institutions & countries, very strong Chinese community that isn't adequately represented at IGC meetings
- Several WG chairs were present (Daven, Yuxuan, Hongyu, Lin, Jintai, Jun, Hong)
- Need expressed to simplify GCHP implementation

10. WRF-GC coupling by May Fu's group (Daniel)

- This coupling is largely operational, some issues to be resolved. May's student Haipeng Lin to be working with GCST on this over the summer.
- Will now be able to run GEOS-Chem chemistry at any resolution using WRF.
- Simplified coupling – may be broader benefits for GCHP.

11. Planning for v11.3 (Daniel)

- GCSC needs to go through list and champion items we really want to see – there will be an email from DJJ to formalize the process

12. Other

- Daniel: Meeting of atmospheric chemistry PIs at NCAR to see how NCAR & university PIs can better work together. Summary by NSF program manager Paul Shepson recognizing GEOS-Chem as outstanding community achievement, recommending NCAR put GEOS-Chem into future planning. NCAR now starting work on generalized model framework called MPAS/MUSICA; GEOS-Chem developers will be involved in the build, summer meeting at NCAR to discuss this.
- Seb: CESM/GEOS-Chem coupling somewhat functional, running at Harvard. Gas-phase chemistry, heterogeneous chemistry working in CESM2. Still work to be done propagating aerosol radiative processing back to CESM.