

**GEOS-Chem Steering Committee Telecon**  
**August 10, 2015 9:30-11:00 Eastern**

**Attending/Missing:**

**Peter Adams, Kevin Bowman, Mathew Evans, Emily Fischer, Jenny Fisher, Colette Heald, Barron Henderson, Daven Henze, Chris Holmes, Daniel Jacob, Dylan Jones, Prasad Kasibhatla, Hong Liao, Jintai Lin, Hongyu Liu, Michael Long, Randall Martin, Dylan Millet, Andrea Molod, Steven Pawson, Jeff Pierce, Jun Wang, Yuxuan Wang, Shiliang Wu, Bob Yantosca, Lin Zhang, Qiang Zhang**

**1. General Updates (Daniel)**

- Feedback on IGC7: overall very satisfied; poster session much improved; some complaints on the structure of WGs and overlap of clinics to be discussed prior to IGC8. Special thanks to Randall for working on the agenda and for financial assistance from UK, China, Harvard, MIT, EPRI, and US agencies
- V10.1 released in June, everything appears to be going well
- Status of v11.1. One-month benchmarking complete for v11.1a and 11.1b
- Updates on the horizon for v11.1: FlexChem, harmonizing Henry's Law across modules, working on uniformity of units, support for MERRA2, flexible precision (reduce memory usage), netcdf diagnostics
- Mike Long has been working on high resolution simulation at Goddard (12 km). We now have a mature GEOS-Chem module for ESMs, would be great to have more folks working on this. Lin Zhang has expressed interest in working with Beijing Climate Center.

**2. Engineer's Report (Bob)**

- Matt Yannetti has been working on timing operations in GEOS-Chem (useful for debugging)
- FlexChem will be its own sub-version of v11.1 and have its own benchmark; will test this with range of configurations for chemistry (not just full-chemistry). Note that as a result SMVGEAR will be retired after this.
- MERRA2 very similar to GEOS-FP, so expect to be ready for MERRA2 in GEOS-Chem in a couple of weeks (likely v11.1c or v11.1d). Will need a bit more time to do full evaluation.
- Harvard is switching from old email server to google groups; should be seamless.
- Have identified compilation problems with ifort15. Currently under investigation.

**3. Dry vs. wet units and transport issues (Kevin)**

- Previously the code assumed dry air mass but more recent versions of GEOS met products now account for water vapor in the computation of surface pressure, so this assumption is invalid. A group has been investigating when it's appropriate to convert between dry and wet in the GEOS-Chem code (units in restart and transport). Note that current inconsistency impacts the long-lived tracers in particular (differences on the order of a percent).
- Review of status of transport last month identified a moisture imprint on dry vmr from wet-to-dry unit changes. This is still being investigated.
- Running a series of tests to ensure mass conservation and that issue is resolved.
- Harvard is going to follow up on including a passive tracer for testing. We should perhaps also consider closer comparisons with GEOS GCM and CTM.

**4. GMAO news (Andrea)**

- MERRA2 release: first stage will be monthly means & 2D field released within 2 weeks; the full 3D fields (needed to run GEOS-Chem) are starting to move over from Discover for public release, time-table is unclear but likely in a few months. In the short-term Bob Yantosca will be pulling MERRA2 directly for a GOSAT project at Harvard.
- MERRA2 superior to MERRA1 particularly with regard to more recent era and avoiding precipitation jumps in assimilation.
- Now happy with GEOS5 CTM, it's running with passive tracers and GMAO driving datasets, just waiting for final hooks to GEOS-Chem.

#### 5. Hosting GEOS data sets (Randall)

- Current storage of MERRA is 20 Tb; MERRA2 could be 2x or 3x this
- Dalhousie storage has been restructured to handle these needs for short term
- Need to explore longer term storage option:
  - Randall preparing a proposal to Compute Canada for a repository. Would need to be renewed every 5 years, but unlikely a solution to support the entire community.
  - Other option is storage at GMAO (seems more natural). Currently stalled. Suggest a collective letter to NASA. Kevin suggests that the wisest option would be to put the logic for sub-setting & gridding on the server side. Andrea says that this is all in place for MERRA2. However there is some special handling required for GEOS-Chem which is not currently present, but perhaps could be implemented. To be explored.
  - Mat Evans & Paul Palmer are discussing with UK data center (British Atmospheric Data Center; currently storing CCMI and have fast data connection). Nice option to have data in Europe and possible redundancy with a US archive. Will work with Randall to scope this.

#### 6. Flexchem update (Mike)

- FlexChem will go in v11.1b in a parallel track. Will have much more extensive benchmark than standard 1 year and when ready will be re-integrated into v11.1. Upon release of v11.1 SMVGEAR and all associated files will be retired.
- FlexChem will be based on KPP-A version of chemical mechanism. Proprietary elements of KPP-A are accelerated compilation for GPU, but not needed at this time for standard GEOS-Chem, so no license issues. Harvard will have a proprietary license. Mat raised some long-term concerns about not being able to see source code of KPP-A itself so this is an issue to consider.
- At this point have only done full-chemistry; will then proceed to other specialized simulations.

#### 7. Stratospheric evaluation and benchmark (Dylan J.)

- Have run strat chem for 2006-2012 (GEOS-5) period with v10.1, and plan to continue running through the future to produce offline fields that are needed for other simulations.
- Circulated comparisons with OSIRIS. Ozone latitudinal dependence in stratosphere looks very nice and model captures vertical profile. Model is high in NO<sub>y</sub> in upper-strat.
- Suggestion for stratospheric benchmarks: latitudinal, seasonal, and vertical variations of O<sub>3</sub>, NO<sub>y</sub>, NO<sub>2</sub>, NO<sub>x</sub>:NO<sub>y</sub> against OSIRIS and ACE-FTS and also CO, HCl, and ClONO<sub>2</sub> for profiles only (in addition to difference maps from current benchmark, and a separate set of zonal mean plots that look only at stratosphere).

## 8. Adjoint Updates (Daven)

- A major development has been integration of code from Lin Zhang to support FP meteorology. Additional releases to patch bugs.
- Now working on incorporating HEMCO into adjoint and closely following the unit conversion discussions.
- Hope to be able to use FlexChem in the adjoint, but development timeframe unclear. Will make it easier to ensure consistency between forward model and adjoint.

## 9. Working Group Reports

### a. Carbon Cycle (Kevin, Dylan J.)

- Coming up with a process to dealing with time-varying chemical source for CO<sub>2</sub> (esp. biomass burning)

### b. Transport (Andrea, Hongyu)

- More active collaboration between GMAO and Hongyu
- Implementing two other Rn simulations into GEOS-Chem and will be evaluated with surface and profile observations. Results will be presented at AGU and then include this in future benchmarks.

### c. Hg and POPs (Jenny, Chris)

- Emission updates ready to go in; bug fixes to ocean mixed layer depth; Arctic updates

### d. Nested Model (Yuxuan, Jun, Lin)

- Some concerns from IGC7 that v10.1 nested model not working properly, is currently being investigated by WG
- Note (from Randall) that nested model does not parallelize as efficiently as global model

### e. Chemistry-climate (Hong, Shiliang)

- Lots of interest in MERRA2 for long-term simulations

### f. Chemistry (Mat, Barron)

- NO<sub>2</sub>+OH rate constant discussion with Stan Sander
- Harvard & York have been working to combine Br and I work
- Telecon next week for isoprene chemistry
- Identified a photolysis issues (likely related to stratospheric O<sub>3</sub>) with v10.1 GEOS-5. Bug fix to be submitted.

### g. Organics (Dylan M., Emily)

- Eloise has been working on a reduced Criegee scheme (has been discussed with Organics and Chemistry WG) and will be submitted to standard code.
- Terpene chemistry under discussion, needs to be discussed with Aerosol WG
- Proposed update for v11.1 update treatment for methane in full chemistry; Lee Murray has come up with krieged monthly means that can be transported (one extra tracer). Consistent, but more sophisticated, with a treatment in UCX.

### h. Aerosols (Colette, Peter)

- V11.1b included many aerosol updates, to be verified asap (WG chairs away last week), note many of the updates are options that are not benchmarked

**i. High-performance GC (Randall, Mike)**

- Substantial development of HP documentation: two new wikis one for WG and one for installation instructions. Note that this last not directly linked to GEOS-Chem website because don't want people to find this by accident and assume that it is scientifically validated.
- Matt Yannetti working to come up to speed from Mike Long and his notes have served as basis for wiki
- Plan for release version of GC-HP by the end of 2015