

GEOS-Chem Steering Committee Telecon

February 3, 2016 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

• General Updates (Daniel, Randall)

- Dylan Jones and Randall succeeded in a grant application to Compute Canada for storage for preparation and dissemination of GEOS met fields. They have been allocated sufficient resources (80TB) for three years. There are some technical issues to work out about the dissemination procedure. This may facilitate more advanced download capabilities such as GridFTP that Prasad had advocated.
- In consultation with the nested working group, Junwei Xu at Dalhousie has begun archiving an Asia grid that encompasses all of India, China, and Japan. This was motivated by concern about missing part of India, and about missing Japan. This will replace the China nested grid going forward.
- Dalhousie (Junwei Xu) also has started mass production and archival of the prepared Merra-2 fields. Given the extra space, and in preparation for GCHP, she is also archiving the finest resolution in addition to the traditional nested and coarser resolution datasets.
- Discussion of nested resolutions. Consensus for single GEOS-FP nested resolution at 0.25°. There has been no demand for a 0.5° GEOS-FP nested simulation. Yuxuan notes buffer zone developed by Lin enables nimble switch across different domains. Daven: adjoint interest at 0.5 degree. Will explore use of Merra-2, which has native resolution of 0.5°.
- Randall provided to the wiki a recommendation for chemical and transport timesteps as Bob outlined in the GEOS-Chem Newsletter. Recommend chemical timesteps of 20 minutes and transport timesteps of 10 minutes for simulations when sufficient CPU resources are available. Fine horizontal resolution generally should take priority over fine temporal resolution. In some cases, it may be beneficial to use coarser timesteps for initial simulations, and the recommended resolution (C20T10) for final simulations. Encourage

specification in publications of the duration of operators due to their effects on simulation accuracy. GCSC agrees to make this change in default model.

- **Engineer's Report (Bob, Mike)**

- Version in the works (v11-01f) focuses on structural updates in preparation for flexchem. Physical and species parameters now defined in only one place in the code. Cleaned up inconsistencies. Also removed dependence on gridbox area.
- Flexchem is planned for v11-01g. The troposphere-only ("Tropchem") mechanism now works completely within FlexChem. Now working on benchmark mechanism including UCX. Flexchem release will completely eliminate SMV-Gear.
- Once FlexChem is implemented we will resume chemical model development with v11-01h. Updates in isoprene and halogen chemistry may fit in v11-01i.

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

- Transport of long-lived tracers like CO₂ shows a pattern correlated with moisture. In process of writing a JPL tech document that will be distributed over next week that will summarize issue and solution. Solution is to convert wet pressure in the input GEOS data to dry pressure. This removes the wet signature and solves the problem for passive trace gases. Kevin will work with Lizzie to test if this is OK for the full-chemistry simulation.

- **GCHP progress and issues (Mike)**

- Identified advection problem in Cube Sphere dynamic core used in GCHP. Seb Eastham (Harvard) identified a solution last week. Further testing is ongoing.
- GCST is working on packaging ESMF and MAPL libraries to ship to system admins independently of GEOS-Chem. This will avoid the need for GC users to work through ESMF in the implementation of GCHP on their machines.
- Randall: would be good to put GCHP in the hands of non-Harvard groups ASAP for testing.
- Kevin: does passive tracer mode exist? Mike: yes.
- Kevin: Pleiades at Columbia cluster might be useful for testing. Mike: will explore.

- **Working Group Reports**

- **Adjoint model and data assimilation (Kevin, Dylan J.)**
 - Would like to use HEMCO in adjoint but this will require structural updates. Will wait for GCHP version of code.
 - At IGC7, discussed optimizing both emissions and initial conditions through the adjoint. Will work on making this available to standard code.
 - Lot of interest in developing satellite observation operators for NO₂. Will try to coordinate across multiple groups.
 - Kevin: Interest in Tangent Linear Model. Attributes of using a complex variable. Will increase memory requirements. Can complex or real type be defined at runtime?
Daniel: should consider connecting with activities at MIT (Barrett). Will follow up on whether MIT implementation of complex variables in GEOS-Chem for sensitivity analyses can provide template for TLM.

- **Carbon Cycle (Kevin, Dylan J.)**
 - Interest in GCHP.
 - Should connect carbon inversion activities involving 4D-VAR and EnKf.

- **Nested Model (Yuxuan, Jun)**
 - Global MERRA-2 data set to be made available through Compute Canada may allow nested simulations over any user-selected domain. This would involve some code changes in the nested model. Since the MERRA-2 data are NetCDF files it will be possible to read only the necessary met data.

- **Chemistry-climate (Shiliang)**
 - Eric Leibensperger (SUNY Plattsburgh) has generated a new version of GCAP meteorology data for multiple future scenarios. GCAP users can download this new meteorology from the from the Harvard ftp site.

- **Aerosols (Peter)**
 - Still waiting for Rn-Pb evaluation from Hongyu to implement any needed fix to aerosol wet deposition.

- **Chemistry (Mat, Barron)**
 - Developments coming from isoprene scheme.
 - Also working to couple Br, I, and Cl chemistry.
 - Updates to rate constants and bug fixes.
 - Barron: will work on completing carbon and nitrogen balance analyses.
 - Need for telecon between Chemistry and Aerosols WGs to discuss links between isoprene chemistry and SOA formation.

- **Organics (Dylan M., Emily)**
 - Developing capabilities to bring more VOCs into code.
 - Isoprene emission in GEOS-FP is lower than in GEOS-5 but within the range of literature estimates.
 - Dependence of isoprene emission on past temperatures is being reconfigured for implementation via HEMCO.
 - Simulation of acetone points to missing acetone source or excessive photolysis. Paper is in preparation.

- **Hg and POPs (Chris)**
 - Bugs that were found in the v11-01c Hg simulation have already been submitted to the GEOS-Chem Support Team. These were fixed in GEOS-Chem v11-01e (approved 04 Jan 2016).
 - We will be working on the soil emissions and stratospheric spin-ups over the next month.

- **Further discussion**
 - Dylan J. pointed out that centralized access to HDF-EOS libraries should be of interest to GEOS-Chem users working with satellite data. Will pass on these libraries to GCST for inclusion in the standard package of libraries shipped by Harvard with GEOS-Chem.