GEOS-Chem Steering Committee Telecon
June 5, 2014 10-11:30 Eastern

Attending: Daniel Jacob, Bob Yantosca, Colette Heald, Jintai Lin, Emily Fisher, Jeff Pierce, Randall Martin, Jinqui Mao, Yuxuan Wang, Ray Nassar, Dylan Jones, Noelle Selin, Daven Henze, Andraea Molod, Dylan Millet, Kevin Bowman, Prasad Kasibhatla, Shiliang Wu, Lin Zhang, Mathew Evans, Jun Wang

Missing: Steven Pawson, Hong Liao, Elsie Sunderland, Qiang Zhang

1. **News, IGC7 (Daniel)**
    - IGC7 scheduled for May 4-7, 2015. Facilities locked in at Harvard. There is a conflict with the AGU joint assembly meeting that week, but no concerns raised, so this will go ahead. Daniel will start fund raising from US sources (NASA, NSF, NOAA, EPRI, EPA, HUCE), international fund raising efforts welcome.

2. **Status of v10.01 progress (Bob)**
    - 1 year benchmark is in progress for UCX (stratospheric chemistry), which includes FAST-JX.
    - HEMCO currently being implemented in v10.01

3. **J(VOC) issue (Jingqiu)**
    - Photolysis of VOCs is buggy in Fast-JX and this was discovered with implementation of UCX. A task force led by Jingqiu and including Seb Eastham, Katie Travis, and Chris miller reviewed and fixed as needed all JVOCs (including acetone, acetaldehyde, HCHO, MVK+MACR, hydroxyacetone, etc.) in consultation with Michael Prather (who is very grateful). In good shape now in v10.01, but there may remain some open research questions (e.g. carbonyl nitrate) and some issues with acetaldehyde photolysis.

4. **Stratospheric benchmarking (Daniel, Dylan J.)**
    - Discussion of how we should properly benchmark the stratospheric capability and is this part of the standard model or a specialty simulation (such as CO2 simulation)? If part of standard model would double the benchmarking responsibilities at Harvard. If consider this a specialty simulation, as there is no user group, the question is who would be responsible for this benchmarking. UCX will also require 1 year benchmarks (due to transport time scales). It was decided that Harvard will run the benchmarks for UCX, but Dylan J. has volunteered to take charge of developing and reviewing the UCX benchmark.
    - Initial thoughts on what to include in benchmark: Zonal mean profiles of key species (NOx, Cly) species, recent O3 climatology recently published by Environment Canada. Also tracer-tracer correlations and age-of-air diagnostics discussed, to be monitored at major version transitions. Also a suggestion from Mat to look at CCMI datasets.
    - Note UCX runs with all 72 levels of GEOS-5
    - Bob suggests that trop+UCX run time is about double trop-only simulation. Side note from Bob: Looking at installing a faster math library as compilation option to speed up run time.

- Dylan will develop a plan for benchmarking, will send a plan for review to the GCSC in a month.

5. **HEMCO update, implications for benchmarks (Bob, Randall)**
    - Christoph had merged HEMCO into 10.1.c, now merging with latest updates, unit testing to shake out any other problems. Will be integrated in v10.1.e
    - Idea that emissions files read in netcdf and tracked in an internal structure. Much easier to modify scale factors, etc.
    - Many emissions updates will follow after HEMCO incorporated into the code. Since HEMCO makes adopting new emission inventories nearly trivial, will require less benchmarking. Randall has suggested some lumping of updates into two sets. Suggestion to pull MEGAN out separately (with MASAGE NH3) so that we can parse the impacts. The diurnal profile of NH3 emissions will be added together with MASAGE.
    - Bob will review Randall's proposal and re-work the implementation queue for v10.1 accordingly
    - Hg and POPs not currently linked with HEMCO, will need to add this, but will need to run their own benchmark to ensure that these capabilities aren't hindered by HEMCO update.

6. **Status of GIGC (Bob)**
    - Mike Long has been testing GIGC in the NASA GEOS-5 GCM, writing this up for GMD. Finding that chemistry scales very well with number of processors (tested up to ~840 cpus).
    - Also working towards stand-alone GIGC. Almost ready, just need advection routine.

7. **Update on GIGC advection (Kevin)**
    - Meeting in March between Harvard, JPL, GMAO about development of GIGC advection scheme. Agreed that GMAO would lead this as had already started some CTM work in the context of GMI (stand alone of cube-sphere dynamical core). Biggest challenge is mass conservation, related to lat-lon interpolation to cube-sphere coordinate. This work is on-going.

8. **Implementation of GIGC in the UK and in China (including 2-way coupling) (Mat, Jintai)**
    - Led by Paul Palmer. UK has a new hard drive for atmospheric science, so would like to be able to run native resolution globally (either tracers or full chemistry). First need to collect met fields, process those, just getting underway.
    - Similarly in China, Jintai has students eager to work on native resolution. In addition to data processing, the challenge is transport in polar regions (this would not be an issue on the cube-sphere). One solution may be two-way coupling.
    - Two-way coupling has nested simulations in several places with coarse global grid. The question is how the nested can improve the global simulation. A challenge is to have correct and timely exchange of information between model resolutions. Have found this has a large impact on global CO.
    - Question about applying two-way coupling and whether this should be a standard capability. Jintai suggests this code is fairly straight forward to use, will be maintained at PKU.

9. **Need for fire inventory beyond 2011 (Jun)**

- GFED3 ended in 2011. GFED4 0.25degree first version will be available in July (will go through 2013), can expect 6-12 months delay for updates. It is a research product, not an operational product. May be superior to FINN, Prasad will ask Louis Giglio to comment on this. Will be maintained in GEOS-Chem code, likely as the default.
- FINN has been implemented in GEOS-Chem by Jenny Fisher and is ready to go into the standard code. Would be an alternative to GFED and include more recent data, near real time if needed. Some discussion of how to lump fire VOC emissions. Jun has offered to get this implemented in the standard code.

10. **GMAO news (Andrea)**
    - CTM gridded component covered above.
    - MERRA-2 updates: it is running in 4 streams (1980, 90, 2000, 2010), a major validation exercise is planned for this summer. The target for MERRA-2 completion and release is Thanksgiving-Christmas.
    - FP product update in 1-2 weeks, more changes along the way. Because this is an operational product don't expect stability.

11. **Model adjoint updates (Daven)**
    - Major public release of adjoint since last telecon
    - Continue working on emissions updates
    - Adjoint model – data assimilation: working on including updates to selectively optimize initial conditions with emissions (or BC in nested model). Also including aggregation-clustering scheme. UMinn working on N2O adjoint. Now hosting tool from JPL to directly pull satellite observations from NASA repository.
    - In future will need to think about HEMCO and UCX in the adjoint.

12. **Working Group Reports**
    a. Adjoint & Data Assimilation (Dylan J., Kevin)
        - Nothing to add
    b. Transport (Dylan J.)
        - At last telecon, discussed work of Karen Yu at Harvard working on vertical transport in GEOS-FP (big differences in lower resolution of Be-7 and Rn simulations vs. native resolution). Now using native resolution to estimate an additional flux term to the coarse grid and find that the impact is small in the troposphere. Andrea has suggested some alternate formulation that Karen is working on, hopefully will report at next telecon. Also looking at the differences in PBL mixing scheme in GEOS-Chem vs. FP. Long term goal is to develop diffusivities to implement into coarser grids.
    c. Nested Model (Yuxuan, Jun, Lin)
        - Testing and developing China nested grid at 0.25x0.31deg resolution (Lin Zhang @ PKU and Yuxuan Wang @ Tsinghua), Dalhousie has helped provide met fields, also have obtained higher-res Chinese emissions. Have found some errors in the parallelization code that may be responsible for inability of Tsinghua group to match NA nested group results. Continue to work on this.

- Parallelization bugs have been found in nested grid simulation and fixes have been sent to the Support Team.
- Lin Zhang has proposed expanding the buffer zone to a larger area (so reduce high resolution zone, save computational time)

d. Sources and Sinks (Jintai, Qiang)
    - Nothing to add.

e. Chemistry-Climate (Hong, Shiliang)
    - No updates to report, waiting for high resolution met fields.

f. Carbon Gases (Ray, Kevin)
    - Had a telecon on Monday. One issue is how HEMCO will affect planned CO2 emissions updates – todays telecon has clarified this. Discussion of different options in CO2 simulation.
    - Need to consider CF compliance (for CCMI, HTAP, etc.) for diagnostic names – will need to be overhauled in GEOS-Chem in the future.

g. Hg and POPs (Noelle, Elsie)
    - Paper accepted on EDGAR historical inventory on Hg, so emissions will be submitted to Support Team (a different option from the Streets historical inventory).
    - Doing HTAP Hg simulations.
    - POPs simulations in progress: PCB simulation running

h. Organics (Dylan M., Emily)
    - Working with Jenny Fisher getting FINN implemented
    - Photolysis issue for VOCs: Dylan had previously implemented a pressure-dependent photolysis for acetaldehyde, available as a patch.

i. Aerosols (Colette, Jeff)
    - Randall and Jeff's groups are working on harmonizing physics assumptions between bulk and TOMAS scheme.

j. Chemistry (Jingqiu, Mat)
    - Nothing else to add.

13. **Small business for GEOS-Chem applications (Mike Long)**
    - Refer to document sent out by Mike Long on Oxford Street Consulting (OSC)
    - Mike Long & Kevin Wecht recently incorporated an LLC that aims to take advantage of existing demand of GEOS-Chem outside of academia (and even inside) given high overhead of getting model running. Will operate as a pass-through organization to interface clients with individuals who can provide model simulations/capabilities.
    - Discussion has provided positive feedback and also concerns that they have tried to address.
    - Offer direct participation to the GEOS-Chem Steering Committee, on an individual basis.
    - Prasad raised concerns about involving students in this (presents a real conflict of interest for universities), also question about intellectual property. Student issue is an important one

that would need to be considered on an institution basis. OSC would ensure that the IP applies to the results, not any model development itself. Also a question about computing resources being separate. Mike said working on this at Harvard, so others would need to work this out.

- Dylan asked exactly what the role is of the SC. Daniel suggested that it's important that OSC is distinct from the SC. The SC would therefore not endorse it. Prasad seconded this as a COI concern: do not want a situation where the SC, which influences the model development direction, is viewed as doing this for its own profit.
- Noelle also raised the issue that we should not view this as a privileged position, i.e. we don't want to prevent competition. Daven mentioned that other firms are doing this already (Environ and RTI)
- OSC working with Harvard Deans and also talking to Hal Maring at NASA.
- If SC member interested in playing a science advisory role, contact Mike and Kevin
- General consensus: Will be interesting to see the demand, we wish them well at this point, and should re-visit our relationship between SC and OSC on a regular basis.