GEOS-Chem Steering Committee Telecon
November 13, 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

- **General Updates (Daniel, Randall)**
  - Science issues for discussion:
    - Aerosol lifetimes shorter in GEOS-FP and MERRA2. Hongyu's fix extends aerosol lifetimes. Still discussing whether this has degraded the simulation (see Transport WG below)
    - Many issues of chemistry development on the horizon: isoprene chemistry, halogen chemistry,NO2+OH reaction rate
    - Wet & dry units issue on-going (see below)
    - MERRA2 now working in GEOS-Chem (thanks to Melissa & Bob!) for inert tracers, still some testing required for full-chem and aerosol. 1980-present is now available from GMAO. Junwei will be working to make those available to the GEOS-Chem community.
  - Benchmarking v11-01d currently. One year benchmark just sent out and SC should verify this. In this version introducing a stratospheric benchmark; awaiting climatological observations from Dylan. We will add an inert tracer in the Rn/Pn/Be benchmark suite to test mass conservation and spurious mixing ratios.
  - FlexChem has been prioritized because holding up updates related to HPC and unit issues. There will be a dedicated version update for FlexChem and after that we will retire SMVGEAR. Advantages of FlexChem: speed, flexibility, compatibility with adjoint
  - GCHP compiles and runs, still working on getting science output. Modularizing ESMF/MAPL to make it more transparent to users and speed up compilation.
  - GEOS-Chem module in GEOS at Goddard is now mature. Their benchmarking process actually caught a few bugs which have been fixed in the code. Harvard folks are starting to work on very high res (VHR; 13 km) simulations and chemical data assimilation.The VHR run will be a Nature Run for the GEO-CAPE OSSE.
  - Randall: based on feedback from SC members, Dalhousie implemented two data compressions approaches: NETCDF4 and SPARSE (reduced total data storage by a factor of 3 and speed up in download time). No need to change any code, de-compression will happen on the fly in the code. Note that users may need to install NETCDF4 libraries on their system.

- **Engineer's Report (Bob)**
  - Since last telecon have worked through v11-01c and v11-01d. Some concerns about Hg simulation in v11-01c, recommending do not use for Hg at this time.
  - In v11-01d: Hongyu fix for scavenging in GEOS-FP (lifetime of Pb too short compared to obs) consists of turning off scavenging when T<258K and increasing LWC of precipitating clouds. This brings the Pb lifetime more in line with GEOS-5.See discussion under Transport WG below.

- In v11-01d created a data structure to describe molecular properties consistently in one place. Need to have consistency for VOCs between units of moles and atoms C, recommend that we adopt moles everywhere. Daniel will follow up with Dylan & Emily.
- v11-01e updates are mostly structural. Will use mass mixing ratio through most of the code (column calculations, e.g. wet dep, will use kg/m2)
- FlexChem hopefully to be in v11-01e
- MERRA-2 currently not running with full-chem (will require some work on lightning NOx and dust emissions). In the pipeline for v11-01f. Would be useful for long-term simulations related to CCMI (Lee Murray, Chris Holmes, Jintai Lin all may be interested in this).

- **Dry vs. wet units and transport issues (Kevin)**
  - Made progress, but no final resolution
  - Meeting at JPL in September to decide on approach as follows: When you get the fields for the Psurf, convert the wet Psurf to dry Psurf and then run that through TPCORE. When this is tested for 1 year, get mass conservation and don't see a moisture signal in the dry mass vmr. One of the issues is that the pressure fixer code may be inconsistent with this; still TBD.
    - Question: Is it physical to use dry pressure for transport? It looks like that's what TPCORE is expecting, so trying to work in this framework.

- **GMAO news (Andrea)**
  - MERRA2 is out now (1980 onwards) and available to community. MERRA2 has fewer spurious jumps due to observing system compared to MERRA.
  - Anticipating a resolution change (1/8 degree) in the FP system by the end of the calendar year. We will need to think about the implications for the nested grid
  - As soon as GEOS-Chem chemistry is blessed at GMAO, the GEOS-5 CTM will be using this. Some discussion of the need for benchmarks comparing GCHP and GEOS-5.

- **Adjoint Updates (Kevin for Daven)**
  - Most of updates are related to observation operators
  - At recent OCO2 meeting at least 4 different variants of people using GEOS-Chem for data assimilation (different ensemble methods): will work to communicate across these groups.

- **Working Group Reports**
  a. **Adjoint model and data assimilation (Kevin, Dylan J.) → see above**

  b. **Carbon Cycle (Kevin, Dylan J.)**
     - Engineer's report describes recent CO2 updates

  c. **Transport (Andrea, Hongyu) & Aerosols (Peter, Colette)**
     - Hongyu has been testing Rn emission inventories; a new inventory with higher emissions over Asia is available and will likely be implemented next year.
     - Testing convective transport in MERRA and FP shows that FP exhibits much weaker convective transport
     - Hongyu: Wet deposition for Pb-210 testss show that lifetime is much shorter in FP. In order to match lifetime of previous versions, and that suggested by surface observations, did some tuning (change condensed water content and turn off cold cloud scavenging). This is the recommendation they put forward. But they noticed that there

is a 1 day difference in the lifetime calculated in the v11-01d benchmark compared to that estimated in Hongyu's group, so currently exploring that.
    - Peter followed up about whether this is evidence that this improves the vertical profile. This has not been tested with observations but is something Hongyu plans to explore next year.
    - Chris: isn't there evidence that cold cloud scavenging occurs? So should we instead reduce scavenging efficiency rather than turn to zero? More physically defensible
    - From Aerosol perspective: a large change in v11-01b to v11-01d, but those increases are really strong in FT. Concern that this is certainly a problem for BC and likely for other aerosols as well. Need to understand this better.
    - Next step: conference call: Hongyu, Peter, Colette, Jenny (for Hg) Lizzie to follow up on this
- Question about FP: Andrea previously suggested increasing convective mass fluxes in GEOS-Chem when we do grid averaging. Something that should be explored.

d. Hg and POPs (Jenny, Chris)

- Benchmarking v11-01c which included lots of Hg updates. Finding lots of discrepancies with observations; not surprising because many updates not homogenized, so working through that.
- Winter time deposition issue: concentrations already too high, so removing cold cloud scavenging (see Transport discussion above) will take Hg simulation in the wrong direction. Hg rep will be added to the telecon discussion of this issue.

e. Nested Model (Yuxuan, Jun, Lin)

- Nested grid parallelization issue discovered by Randall's group. Transport-only nested is much slower than transport-only global model. This is likely the result of the fact that TPCORE for nested grid is older than the TPCORE used in the global model. Users aren't complaining yet so WG is holding off to see if there's another major transport update (maybe GCHP transport core?)
- HEMCO working very well in nested, but the re-gridding is slower.
- Dylan M.'s group has put together a nested domain over India with GEOS-5. Other similar efforts to develop custom grids in Paul Palmer's group and Jintai Lin's group.

f. Sources and surface update (Jintai, Qiang)

- Most updates will be implemented in future v11 release
- Jintai's group is working to harmonize land use databases for BVOC, soil NOx, and dry dep. Implemented year-varying MODIS data. Note that Jeff Geddes (working with Colette and Randall) has a paper up on ACPD describing a similar effort that was scheduled for submission to the standard code in early 2016.

g. Chemistry-climate (Hong, Shiliang)

- Working with GISS 2x2.5

h. Chemistry (Mat, Barron)

- Mat organized a telecon post-SEAC4RS isoprene work. There will be a follow-up meeting on this.

- Mat's group working on a merged halogen chemistry (Cl+Br+I); will be provided to support team once published
- Chemistry WG is sticking to JPL unless overwhelming evidence otherwise and therefore they have not updated NO2+OH. Growing evidence that this reaction should be slower, esp important for UT. Keeping an eye on this.

i. Organics (Dylan M., Emily)

- Emily working on trying to integrate her PAN simulation into latest code. In the pipeline.
- Emily student working on acetone, presentation at AGU.
- Dylan M. raised that there are lots of updates in carbon_mod on terpenes → need to discuss with Aerosol WG. Colette suggested that this should perhaps be part of the FlexChem discussion.

j. Aerosols (Colette, Peter)

- See discussion above under Transport WG on aerosol lifetimes in v11-01d.
- Prasad brought up concerns that it is hard to tell how well PM2.5 is simulated in the model (varying results in the literature). This is likely due to different model versions and different approaches (i.e. calculating wet or dry PM2.5). Colette suggested that this is currently tracked in the benchmarks. Randall mentioned that there is a PM2.5 database from GBD and we could inquire as to whether we could use this for benchmarks.
- Daniel's group recently submitted a paper on isoprene SOA chemistry; something to keep an eye on, perhaps following FlexChem implementation.

k. High-performance GC (Randall, Mike)

- See updates from Bob above
- Randall's group have been trying to run GCHP on Canadian system. Code compiles, doesn't run yet. Working with GCST on this.