

**GEOS-Chem Steering Committee Telecon  
December 17, 2013 10-11:30 Eastern**

**Attending: Daniel Jacob, Bob Yantosca, Colette Heald, Mathew Evans, Loretta Mickley, Daven Henze, Yuxuan Wang, Dylan Millet, Jeff Pierce, Shiliang Wu, Elsie Sunderland, Hong Liao, Jingqui Mao, Jintai Lin, Emily Fisher, Andraea Molod, Randall Martin, Ray Nassar, Dylan Jones, Kevin Bowman, Qiang Zhang, Lin Zhang**

**Missing: Noelle Selin, Jun Wang, Steven Pawson, Prasad Kasibhatla**

**1. Status of v9.2 (Bob)**

- Getting close! 1 month benchmarks with GEOS-5 and GEOS-FP, working towards 1 year benchmark. Several bugs found in last benchmarking series that are being tackled.
- RH bug in MERRA and GEOS-FP: thought it would only affect ISORROPIA and large particles, but having larger effects on the chemistry, being investigated at Harvard
- Issues with switch from GEOS-5 to GEOS-FP: 30% drop in isoprene pointed out by Dylan Millet, looks like GEOS-FP is significantly colder. GMAO confirms and suggests that this is a reduction in a warm bias in the summer hemisphere, with a slight degradation in the winter hemisphere. Question for organics WG: whether we will need to scale the biogenic emissions to not degrade the simulation. TBD after one year benchmark.
- GEOS-FP O3 columns also much lower from OMI columns currently being used in GEOS-Chem. Brewer-Dobson circulation is a little more sluggish in GEOS-FP so would expect to be lower, but Dylan Jones surprised at the magnitude, considering that O3 in GEOS-FP is assimilated. Daniel will follow up with Steven Pawson.
- Mineral dust increased by 25% in GEOS-FP from surface wind increases. GMAO reports not obvious over land (there are large surface wind changes over ocean). Consider applying a scaling after the 1 year benchmark.
- GEOS-5.2.0 shut off in June, GEOS-FP needed for July 2013 on-wards and need v9.2

**2. Status of GIGC, HEMCO (Bob)**

- Emissions component (HEMCO) now mature, implemented in a development version of the code, Christoph working on a GMD article, will eventually be merged with GIGC updates that Mike Long has been implementing. May be sensible to do a "grand merge" with FlexChem.
- Working on implementing the GIGC code into GEOS DAS, currently working on integrating dry dep code
- Stand-alone transport required for a GIGC, ESMF version. Kevin Bowman looking into a new version of TPCORE.
- Early 2014 target to start testing stand-alone and GEOS DAS system

**3. FLEXCHEM update (Mat)**

- FlexChem is a cleaner integration of KPP and chemical package. Give us more flexibility for changing chemistry
- Testing against v9-1-3 but one issue is the FlexChem doesn't yet have hetchem. Plan to tackle this in the next month.

**4. Priority list for v9-3 (Daniel)**

- V9-3 on the horizon after v9-2 release, so discuss high-priority items
- UCX strat-chem mechanism from MIT high priority, represents new capability for chemistry in GEOS-Chem, will be implemented as an option
- EDGAR 4.2 anthropogenic emissions ready to go very soon (code ready to go), not yet delivered but just needs some additional documentation & evaluation
- MEGAN2.1 update includes some computational advantages, and CLM PFTs, has some advantages for standing vegetation schemes
- NEI 2008 is a fundamental update that affects a wide audience
- RRTMG integration from MIT (LW, SW, gases & aerosols): coded as module interface to 3<sup>rd</sup> party RRTMG code directory. Discussion about APM use of RRTMG: presumably uses the same code base, so could map their module for APM to the same RRTMG code.
- Jintai Lin brought up the 2-way coupling issue, important advancement to be considered for v9-4 after publications
- Will iterate on priority list for v9-3 over email

#### 5. GMAO news (Steven, Andrea)

- Newly completed 0.5 degree data assimilation (1998-present) with model very similar to GEOS-FP.
- MERRA-2 assimilation system about to start. Currently doing sweeper runs (2 degree system) to finalize. Will start in early 2014, will take 1.5 years to complete. Will be less affected by changes to the assimilation data stream, better for long-term trends. Will be at 0.5 degree, run in 4 streams (one per decade). Model version not quite FP (some changes in moist processes) but close.
- Next model release (Ganymede 4), capability to use RRTMG in SW & LW with a switch and very shortly the Morrison & Gettleman microphysics to allow for indirect effect as well. Most relevant to GEOS-Chem integrated within GEOS.

#### 6. Model Adjoint Updates (Daven, Kevin)

- Working on getting HTAP emissions into adjoint and set up for source apportionment for next round of HTAP simulations. Some questions about HTAP emissions (based on NEI08) differ from GC NEI08 development version; to be resolved with Sources & Sinks WG.
- Trying to get users to use online GitLab resources. Will be holding a web tutorial for adjoint community.
- New adjoint version released with several bug fixes
- Working on integrating Kalman Filter from CSU
- High priority will be working on adjoint of UCX strat-chem. Discussion with Barrett group and adjoint WG. Thoughts on postponing until FlexChem, but if UCX precedes FlexChem, may re-visit.
- GEOS-FP adjoint to work with transport scheme.
- General issue of data repository issues as get higher resolution files. Need to consider.

#### 7. Working Group Reports

##### a. Transport (Dylan J., Steven)

- Working on GEOS-5 GEOS-FP vertical transport with Rn and Pb tracers. GEOS-FP has less vertical transport and is very much resolution dependent. Up to 20% bias in Be-7

simulation with 4x5 simulation (dipole between strat & trop). This could be a substantial issue for inversions. Considering using higher resolution GEOS-FP fields to parameterize vertical diffusion coefficients. Down-side is that would need to do this on a species-specific basis. Not clear if also temporally and spatially dependent, or a single parameter will suffice. Needs to be investigated. Andrea Molod may try to back out these coefficients and their variability from a GMI run. Some discussion of approach and how calculate Kz from fine resolution. Will start by archiving vertical wind variance.

b. Nested Model (Yuxuan, Jun, Lin)

- Jun Wang previously reported a resolution-dependent simulation of sulfate revealed by the nested NA benchmark simulation (see 30% higher sulfate at 0.5 degree than global 4x5), don't see this in other species. Lin also shows this for v9-01-03, but due to old LWC. Yuxuan checked this for nested AS in v9-01-01 – see about 10% difference. Karen Yu (Harvard) also doesn't see a big difference in sulfate during SEAC4RS. Conclude that there shouldn't be any resolution dependence in the simulation of sulfate, but working together to resolve this.
- Yuxuan testing 0.25 degree code over NA, but constantly have issues with KPP. Harvard group has not had this issue but had to modify code to keep KPP searching for convergence rather than exiting.

c. Sources and Sinks (Jintai, Qiang)

- HTAP version 2 inventory for 2008 & 2010: new global inventory (EDGAR v4.2) + regional inventories, including NEI08, EMEP, Asia). Should this be included in standard version of GEOS-Chem? Possibly integrate in HEMCO
- Recently updated VOC speciation for Asia. Include more oxygenated VOC emissions. Paper on ACPD. Include for list of potential updates in v9-3.

d. Chemistry-Climate (Hong, Shiliang)

- RT code is a priority for chem-climate. Interest in both Heald group and Yu group versions. Recommend start with MIT version of code because has both LW and SW.
- CO2 inhibition of isoprene emission from Amos Tai to be included in v9-3

e. Aerosols (Colette, Jeff)

- RRTMG patch submitted to GCST by MIT. Recommend inclusion in v9-3.
- Betty Croft developed a radionuclide simulation for Fukushima to evaluate & improve the removal in GEOS-Chem (paper up on ACPD). Has added new radionuclide species (cesium attaches to aerosol, whereas others don't) which allow more detailed evaluation. To be considered for standard code.

f. Chemistry (Jingqiu, Mat)

- Discussion: Strat Chem from MIT based on v9-01-02, so will likely be integrated first. And then later get FlexChem to integrate with this.
- Some indication that Caltech will be providing a new isoprene scheme in the future
- Trying to produce a standard box model (Jingqiu working with Barron Henderson)

g. Carbon Gases (Ray, Kevin)

- A suite of updates (improved temporal resolution of anthro CO2 sources, a year specific biogenic flux climatology). Tested in v9-01-03 and not working in v9-02.
- h. Hg and POPs (Elsie)
- Jenny Fisher asking about when Arctic update can go in
  - Nested grid simulation with new met fields ready from UW
  - Question about whether POPs should be in standard model (MIT, Harvard, MichTech). To be discussed in the future.
  - Also to be discussed in the future: ocean parameterization linked with MIT GCM.
- i. Organics (Dylan M., Emily)
- Emily's PAN paper through review, PAN code ready to go in for v9-3. There is an issue with nighttime chemistry, but have decided to go forward (Caltech update likely far off).
  - FINN biomass burning emissions being prepared for model.
  - Need to discuss if and when Criegee chemistry (from Millet & Evans) should be incorporated in the standard mechanism.