GEOS-Chem Steering Committee Telecon
August 2, 2011 14:30 GMT

Attending: Daniel Jacob, Bob Yantosca, Randall Martin, Colette Heald, Dylan Millet, Yuxuan Wang, Jeff Pierce, Jingqui Mao, Jun Wang, Steven Pawson, Noelle Selin, Daven Henze

Absent: Kevin Bowman, Mat Evans, Lyatt Jaegle, Dylan Jones, Prasad Kasibhatla, Hong Liao, Loretta Mickley, Ray Nassar, Paul Palmer

Progress toward v9.1.2 (D. Jacob and R. Yantosca)

- Several internal versions with 1-mo benchmarks. Latest is wet deposition updates from Helen Amos that took a bit of time to go through bug fixes, etc., but is ready now and posted online.

Benchmarking Process (D. Jacob)

- New benchmarking process working well, has slowed things down, but probably for the better
- To be resolved: after 1 month benchmark approved by developer and Daniel, do we need a time period for GCSC to browse through output? If we post 1 month output as soon as available, the time interval for developer and Daniel to look at should be sufficient for any interested GCSC member to look at this. Important issue is to have a record of changes for the major benchmarking pre-release to ensure we can track changes.

Chemistry-Climate WG Report (H. Liao, L. Mickley)

- Improve communication among group members via wiki; we are working on this now;
- Link CESM/CAM5 to GCAP model; Seoul, U Tenn, starting 2011;
- Move to 2x2.5 versions of Model E/ Model 3; Harvard will complete ModelE this fall, and Model 3 by 2012;
- Apply AR5 scenarios to GCAP; Harvard, fall 2011; IAP can help with AR5 historical and future RCPs if needed;
- Set up longwave and shortwave forcing code in GCAP, SUNY Albany.

Adjoint & Assimilation WG report (D. Henze, K. Bowman, D. Jones)

- To be released soon: dust, methane, estimation of the inverse Hessian
- More development underway on the CO2 side and with observational operators
- Work on the full chemistry nested NA adjoint just getting underway now at Toronto and U Colorado, hopefully ready this Fall.

Sources and Sinks WG Report (R. Martin and P. Palmer)

- 1950-2050 emissions for ozone/aerosols precursors developed by Eric Leibensperger. No specific interest stated beyond Randall's group. Will put a write-up on the web, but will not integrate in standard code for now.
- Ray Nassar pointed out at IGC5 that IDL regridding algorithms forced to go through 1x1, so loss of information for high resolution. Proposed an alternative Fortran code from S.J. Lin, some

technical issues at the pole, but Matt Cooper investigating and could work on modifying this as the standard.

Chemistry & Oxidants WG Report (M. Evans, J. Mao)

- Updated GC chemical mechanism with JPL June 2011 (10-12 reactions modified). Big differences in DMS (more than 50% over polar regions) → could impact aerosol WG
    - Planned for v9.1.3
- HO2 uptake produces H2O2 in the standard code, Jingqiu recommends changing this in the future.
- N2O5 uptake still under investigation. Know that it is too fast in the current standard model. Currently folks interested in NOy are using McIntyre and Evans paper. But apparently some issue to resolve between Steve Brown's methodology and what Mat and Helen implemented
    - Need to include in chemistry update in v9.1.3 – hopefully resolved by that point.
- Ron Cohen's group working on methylperoxy nitrate chemistry from ARCTAS – could be important in UT. Jingqiu working with that group to implement this.
- Dry deposition of OVOC ready to be implemented in standard code. Did find a bug after IGC5 to demonstrate that ozone impact wasn't as large at Jingqui suggested.
- Jingqiu is working on night time chemistry, not mature at this time.

Aerosol WG report (C. Heald and J. Pierce)

- SOA updates from Havala Pye in pipeline – complicated update, other updates planned for v9.1.2 include AOD code, APM microphysics, ISORROPIA II clean-up
- Offline aerosol simulation: Jeff has had some issues running, there are bugs in emissions routines, Bob has been looking into this and will aim to get this into v9.1.2. Colette and Jeff will survey Aerosol WG to find out who actively using the offline simulation and think about updating production rates, etc.

Carbon Gases & Organics WG Report (D. Millet, R. Nassar)

- Scaling fix for GEIA anthropogenic emissions over S. Africa has been submitted to GC Support Team for v9.1.2
- Dicarbonyl simulation not compatible with current version of code. May Fu is working on this in v9.1.1 but she is integrating this with Paulot chemistry scheme, with the thought of submitting one update. Do we need to keep separate options? If we integrate we will need to include acetylene and aromatics as extra tracers. Balance the cost of extra tracers with the cost of having extra chemistry options. Question is what is the slow down? Possibility to have dicarbonyl chemistry as standard mechanism, but then an option to switch off acetylene/aromatics. This could be done using a pre-processor for the chemical mechanism and would have more general application. Will revisit this once May's update is mature – discuss as well with Mat and Jingqiu.
- Acetone simulation: new simulation by Emily Fisher correcting previous simulation biases is mature and will be sent for implementation in standard model soon.

- Question was raised at IGC5 whether we can retire GEIA biogenics. Main stumbling block was acetone, but with Emily's updates we will be able to retire this.

Regional AQ WG Report (Y. Wang, J. Wang)

- Nested grid CO2 simulation code has been sent to Dylan Jones and Ray Nassar. Dylan has a postdoc who will be working on this.
- Change the name from Regional AQ WG to Nested Model WG

Hg and POPs WG Report (L. Jaeglé, N. Selin)

- Hg: v9 does not currently work at 2x2.5 (ocean files are at 4x5), but hopefully will be updated in the Fall
- POPs simulation to be submitted to the standard code (PAHs) likely v9.1.3. Shiliang Wu interested in using this simulation.

GMAO Developments (S. Pawson)

- Going to new system (GEOS5.7.3) in mid-August at 0.25x5/16. Will overlap for ~6 weeks and then discontinue GEOS 5.2.0 end of September. MERRA (GEOS5.2.0) will continue, but as older satellites fail have less data (AMSR, etc.), possibly add in IASI, so will be working on a replacement for MERRA.
    - Nested grid working group will work on implementing this high resolution in GEOS5.7.3
    - Going back in time with GEOS5.7 likely to take a couple of years. Hope is that will do 1990's to 2000's as an internal product and might put out something, but likely will be system jumps b/c this would serve as testing.
    - No detrainment field in GEOS5.7.3 like previous versions. Steven will check into this. Convection scheme hasn't changed (still RAS), but different closure.
- PBL definitions in GEOS5 products (raised by Randall): nighttime PBL over land is too low. Issue is with the diagnostic. Online GEOS doesn't use this diagnostic, other CTMs using 3D turbulent coefficients (Kz) instead of this diagnostic. So long term strategy: change the diagnostic or change how this is done in GEOS-Chem. Are there alternative met fields we could access? In MERRA there is a 3D field of KH (on pressure levels), i.e. eddy diffusivities, but only every 3 hrs (unlike hourly PBL diagnostic). Jintai's non-local scheme doesn't appear to fix the issue (from Randall's preliminary tests). Daniel will contact Jintai about using his scheme to calculate PBL instead of relying on PBL diagnostic. Randall will also follow up on this.
- GEOS6 will be 10 or 15 km in future
- Sub-grid parameterization for vertical transport missing when regrid to low resolution. Looking into this at GMAO, hopefully release a recommendation (i.e. code to accompany re-gridding) in the near future.

Grid independent GEOS-Chem (R. Yantosca, M. Long)

- Work to build a column version of GEOS-Chem for interface with the GEOS DAS has been redirected by Mike Long toward a grid-independent version of GEOS-Chem. This will retain the

3-D structure of the current GEOS-Chem but allow the user to do computations for any ensemble of (x,y) horizontal points with or without transport. A calculation for a single point without transport will correspond to the column model. The grid-independent model will ensure consistency between the on-line (GEOS) version of GEOS-Chem and the off-line version. Two other advantages are (1) minimum disruption to off-line users, (2) facility to interface GEOS-Chem with any meteorological fields including through ESMF.

- Work to develop the grid-independent model is ongoing (Mike and Bob). Large effort to unravel legacy code.

Graphical Processing Units (GPUs) for future GEOS-Chem computing (R. Martin, M. Long)

- GPUs were developed for video games @ very high performance (10-100x faster than CPU), originally designed for low memory applications. But more recent interest in using for scientific computing
- Current available board from Invidium 6 Gb RAM @ double precision. Continuing to increase memory and reduce the barrier porting code from CPUs to GPUs. Randall's considering purchasing a board and testing. Kumaresh Singh did some testing with GPUs a few years ago, didn't really pan out at the time. Bottle neck is data transfer. But Mike Long has worked successfully with GPUs in running KPP at Oak Ridge. Randall will follow up with Kumaresh and Mike.

General comments (D. Jacob)

- GEOS-Chem website: some things are obsolete. Daniel asked that the GCSC browse through co-authorship credits as well as the narrative.
- At IGC5 we talked about having GC data available at different nodes in EU and China. Jack Yatteau reported that there was a lot of enthusiasm at the meeting, but no material action making external nodes available since that meeting. Need at least 30 Tb to make this work. Randall (5 Tb), Rokjin (?), Mat (?). Difficult for Chinese groups to participate, can't download data outside of China. So within China, made an internal plan for accessing/sharing data - unified efforts to download and/or share disks.