

GCSC Meeting post-IGC10

10 Jun 2022 - Washington University in St. Louis + Remote

Attendance: Dylan Jones, Pam Wales, Barron Henderson, Jeff Geddes, Prasad Kasibhatla, Fangqun Yu, Yuxuan Wang, Lee Murray, Will Porter, Eloise Marais, Seb Eastham, Bob Yantosca, Randall Martin, Daniel Jacob, Lizzie Lundgren, Bob Yantosca, Chris Holmes, Amos Tai, Melissa Sulprizio

Initial feedback on IGC10:

- Very nice having us all together for poster sessions / dinner
- Prefer that it meetings would be in the same place
- Might be nice to have one night free so people can sightsee
- Knight Center Hotel on campus was great. Capacity is for 60, but there was competing meetings going on. Maybe next time, can reserve larger capacity. Need more lead time in planning.
- For dorms, maybe one more pillow
- Dorms being cheap offset the price of flights for long-distance attendees
- Kudos to staff for preparing a gluten-free option for meals & desserts
- Event planning staff was fantastic in general
- Poster session: Posters down the hallway were not well trafficked.
- General consensus to have posters up all together.
- Could potentially put posters on 2nd & 3rd floors for overflow, but maybe that separates people from each other.
- Excellent bar staff! Good that drinks were in middle of the posters
- Food being separate from posters was really good—you could take a break from posters & come back. Hors d'ouvres were also good
- Fewer questions from early career scientists during plenary. Maybe dedicate the 1st question to the graduate students. Daniel told students to ask a question to get travel funded. Early career scientists may have approached for direct questions later on.
- Asian remote attendees: time zone makes it possible only to attend the morning sessions.
- Asking questions on the chat would have been nice
- Not all questions were repeated by the speaker so remote audience couldn't hear
- Some speakers were hard to follow due to presenters sometimes speaking too softly. Maybe a reminder to presenters to speak up.
- What was the reasoning for not recording the sessions? We wanted the clinics to be recorded but that was an error. Didn't want the talks recorded because we didn't want to affect what people wanted to share? A closed meeting format would let people share remarks candidly. Password protecting the meeting is another idea.
- Recording would be good for Asian attendees. Could also potentially make the recorded talks available for some time then take it down. Suggest recording talks by default. At some other meetings, talks are recorded but Q & A were not.
- By default, everyone's slides will be posted by default unless they opt out.
- One suggestion: to type the questions asked by the audience into the Zoom chat.
- Afternoon sessions were a bit long.

- Prefer to keep 1.5 hr lunch break, but a shorter break before the Working Group breakouts.
- Would have been nice for breaks in-between clinics
- If we need a larger space for IGC11, there is an auditorium style room in the Knight Center. But capping the meeting makes it easier to manage the meeting.
- Would like to restore the Regional Meetings in Asia & Europe (perhaps in London) – to relieve some pressure on people attending the IGC meetings.
- GC Asia was 2.5 days, and was very successful. Too expensive for Chinese users of GC to come to the US for IGC meetings.
- What is the best way to make sure to make sure that we don't fragment the GC User community if we have IGC, GC-Asia, GC-Europe meetings? One way is to make sure that any development ideas that are made at regional meetings get passed to the GCSC to ensure continuity & comprehensiveness.
- Another alternative is to rotate IGC between the 3 regions. But maybe we want to have the meeting near the center of gravity of the community.
- This year at IGC10 we didn't turn down any participants. 165 in person, 100 virtual.

GEOS-Chem 14.0.0

- 14.0.0-rc.0 release candidate released prior to IGC10
- Zero diff version w/r/t 13.4.0.
- Main updates GMAO libraries up to date.
- Still some diffs when splitting up GCClassic runs into separate stages (e.g. monthly)
- KPP version 2.5.0 facilitates things adding adaptive solver in the future
- 4D species array to 3D → facilitates memory improvements for running GC in GEOS or GCHP
- Going to add an update to clean up the GCHP run directory
- Also a few minor bug fixes.
- 10yr benchmark is going now. Hope to release when ready
- Feeling is that we should do a comparison of TracerTransport with the online model at GMAO – use it as a check to see if we are doing transport properly. This would be a scientific investigation.
- We could do a 1-yr TransportTracer simulation to rule out any numerical diffs that came in since 13.4.0.
- Luo wetdep scheme: Currently an option in GEOS-Chem, we would like to bring it in as a standard. There is some work to be done with scavenging in cold clouds (Pb210 lifetime was too short). Gan Luo at Albany is making some improvements to the scheme, and Hongyu Liu will test it with Pb210.
- There seems to be a timestep dependence with the Luo wetdep, this has prevented it from being added into the model as standard.

Roundtable of future visions for GEOS-Chem priorities

- What are our long-term (5-10 yrs) visions for GEOS-Chem?
- GEOS-Chem has always developed organically, and we are still doing this.

- Offline vs. online issues when you go to higher resolution. Offline transport errors need to be looked at seriously. As computational power increases, the transition to online might be a moving target.
- We don't want to cut short the pipeline of fine-resolution met fields because that is what is driving our nested-grid simulations (which is giving us a lot of science)
- Offline met fields may hit a limit – GMAO may not be producing c1440 or greater, so at some point we need to think about a downscaling approach to ingest coarser data but run at finer meshes. Could be an attractive new capability eventually.
- There will always be demand for the offline capability. Not all users will be able to migrate to the online model due to resources.
- Can we use shared directories on NASA supercomputing resources? Ownership permissions/security is a bottleneck. Have to get security clearances etc for users.
- Wonder if funding agencies will start giving credits for the cloud. The cost of the cloud can be prohibitive.
- NASA/NOAA are putting a lot of their data in S3 buckets. NASA is interested in bringing the model to the data (e.g. IMI). Steven Pawson is a big advocate of putting GEOS data on the cloud.
- If GMAO would host their data on the cloud, then we wouldn't need to host it on WashU. Users might be able to get credits in funding. AWS has egress fees of \$30/TB (or \$5000 for entire archive) Some NASA products are open-source and for free download.
- Some performance updates can be made to GC-Classic (investigate GISS domain decomposition, move away from OpenMP). This would make GCClassic an MPI code.
- Is everyone resigned to slow speed? When we go from 47 to 72 levels it is a 50% decrease in runtime. GMAO will go to 181 levels soon. Can we lump levels on the fly?
- Acceleration of chemical solvers. Adaptive chemical solver/KPP and online neural net solvers? Are they parallel efforts? Adaptive solver gives about 30% speedup on the kinetics and 3-5% on the whole run. Speedups in chemistry are negated by transport, photolysis, etc, so you won't get an order-of-magnitude speedup.
- Transport gets harder & harder when you get more species. Christoph Keller is looking into culling transported species (i.e. don't transport certain species in the stratosphere). Potentially big speedups. Need to look at the entire system.
- Another bottleneck is convective washout. Maybe the code isn't efficiently written.
- Maybe what can be done for improving compute access is to set up a request on AWS that would run the compute on the NASA side, then results get pushed to an S3 bucket.
- We no longer have a binary choice in chemistry – would it be worthwhile to introduce a reduced chemistry scheme? But since we added Halogen chemistry, the number of species in tropchem & fullchem were the same. It would be more maintenance – the practicality of keeping multiple mechanisms leads to difficulties.
- Could we benchmark mechanisms using a box model? Can we make GEOS-Chem a box model that runs in FOAM.

Review of the WG and leadership structure

- What do people think about the WG/leadership structure? It is growing. There is no voting. GCSC structure leads to stability. Seems like it is not unwieldy at this stage.
- Volunteer basis seems good
- We should suggest & recruit members who are more representative of our community (gender, racial, international diversity).
- Scientific diversity is baked in since everyone is co-chairing a working group
- There are some processes in the model that is not covered by a WG – such as PBL mixing. (This might fall under transport.)
- What should we do about deposition? It may be that Chem-Eco-Clim WG has picked this up. “Ecosystems” refers to land cover models etc. in ESMs, deposition has been kind of lumped into this WG.
- Proposed to have Emissions, Chemistry-Climate and Ecosystems-Deposition WGs. Ecosystems-Depo would also include deposition to oceans. Could be an opportunity to recruit for diversity. Send recommendations subsequent to this GCSC mtg.
- Wet dep has always been part of the Transport WG
- Biosphere-Atmosphere interactions could be another WG possibility. There is a critical size of people that could be in this WG. Not sure how to share tasks/responsibilities.
- Could also timetable at the IGC meetings so that WG attendees can attend each other’s meetings – “leaky”
- Presentations are in plenary, but WG’s are in parallel. Maybe reverse it for next IGC’s
- Summary: No dissent about moving deposition out of emissions. Some enthusiasm for biosphere-atmosphere and chemistry-climate WG’s. Can reorganize existing members of the 2 groups into the 3. Also recruit fr diversity.
- We also have nested model issues; who takes it over?
- WG chairs are not responsible for model development.

Announcements

- Prasad had idea about who has run what model w/ what version: making a spreadsheet
- Dylan J. comment about GCPy developments that were duplicative across community, will set up a Google doc to list resources & reduce duplication. Look to SEWG to connect with this initiative
- Benchmarking: Observations are out of date, Jingqiu will lead an initiative to help update these observations. Ozone in particular.