GEOS-Chem

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1. Featured News

What's new in GEOS-Chem 14.1.0

GEOS-Chem 14.1.0 will introduce a number of useful new features, several of which we spotlight below. We hope to release version 14.1.0 shortly, pending successful completion of the benchmarking and evaluation process. For a full list of updates, please see the GEOS-Chem 14.1.0 wiki page.

Chemical mechanisms rebuilt with KPP 3.0.0, with auto-reduction option

The chemical mechanisms in GEOS-Chem 14.1.0 have been rebuilt with **KPP 3.0.0**, the latest version of the **KineticPreProcessor** software.

KPP 3.0.0 adds several important new features, most notably the `rosenbrock_autoreduce` solver. This solver can reduce a complex mechanism into a simpler mechanism on-the-fly without any preprocessing or switching between multiple mechanisms. It separates species that are deemed "slow" (which can be integrated with a 1st-order scheme) from species that are "fast" (which need the full Rosenbrock integration method) at each chemistry timestep. Using `rosenbrock_autoreduce` can speed up a simulation by as much as 30 percent!

We have rebuilt the GEOS-Chem `fullchem` mechanism with the `rosenbrock_autoreduce` solver. You may choose to activate or deactivate the automatic mechanism reduction feature with a toggle in the `geoschem_config.yml` configuration file. When the auto-reduction is disabled, the traditional Rosenbrock integration method is used instead. Auto-reduction is switched off by default.

References

- H Lin, MS Long, R Sander, RM Yantosca, LA Estrada, L Shen, DJ Jacob, *An adaptive auto-reduction solver for speeding up integration of chemical kinetics in atmospheric chemistry models: implementation and evaluation in the Kinetic Pre-Processor (KPP) version 3.0.0*, JAMES (in review), 2023. DOI: 10.31223/X5505V

Carbon simulation using a KPP-generated mechanism

We have developed a new carbon (CH4-CO-CO2-OCS) simulation following Bukosa et al [2021]. This new simulation uses a KPP-generated chemical mechanism (named `carbon`), and will eventually replace the existing CH4, CO2, and CO specialty simulations.

We have brought the source code for the carbon simulation into GEOS-Chem 14.1.0**, but note that we are still validating this simulation, and you should not use it yet. I**If you are interested in helping out with the validation process, then please contact the GEOS-Chem Support Team.

Reference:

- B. Bukosa, J. Fisher, N. Deutscher, and D. Jones, *Development and evaluation of a coupled carbon gas (CH4-CO-CO2) simulation for modelling of greenhouse gas distributions and co-variation*, *Atmospheric Environment*, in review.

Hg simulation updates: Improved drydep of Hg0; AMAP emissions

We added two important updates to the Hg specialty simulation in GEOS-Chem 14.1.0 based on the recommendations of the Hg & POPs Working Group.

1. **Ari Feinberg** (MIT) developed an improved dry deposition scheme for elemental mercury. Ari writes:

   > The main change is that Hg0 dry deposition reactivity (`f0`) is set to `3.0e-5` everywhere except for the Amazon rainforest, where it is increased to `0.2`. These changes yield improved agreement with observations of Hg0 vegetation uptake, Hg0 seasonality in the Northern midlatitudes, and Hg0 levels in the Southern Hemisphere.
   >
   > Note that in order to balance the dry deposition changes and maintain good agreement with levels of Hg0 in the Northern Hemisphere, the photo-reduction of Hg(II) in organic aerosol needed to be re-calibrated.
   >
   > I also attach a benchmark file showing the resulting differences for the Hg concentrations, fluxes, and budget.

2. The AMAP/UNEP 2018 Global Mercury Assessment emissions inventory (Steenhuisen and Wilson 2022; Steenhuisen and Wilson 2019) is now the default global mercury inventory. The emission year is 2015.

References:

- A Feinberg, T Dlamini, M Jiskra, V Shah, NE Selin, 2022. *Evaluating atmospheric mercury (Hg) uptake by vegetation in a chemistry-transport model*. Environ. Sci. Process. Impacts. 2022. DOI: 10.1039/d2em00032f.
- F Steenhuisen and SJ Wilson, *Geospatially distributed (gridded) global mercury emissions to air from anthropogenic sources in 2015*, DataverseNL, V1, 2022. DOI: 10.34894/SZ2KOI,
- F Steenhuisen and SJ Wilson, *Development and application of an updated geospatial distribution model for gridding 2015 global mercury emissions*, Atmos. Environ., 2019, 211, 138–150, DOI: 10.1016/j.atmosenv.2019.05.003.

Option to use HTAP v3 emissions in your simulations

Dandan Zhang (WashU) prepared the Hemispheric Transport of Air Pollution (HTAP) v3 inventory for use with GEOS-Chem 14.1.0. The HTAPv3 data may be downloaded from the WashU server (geoschemdata.wustl.edu) and can be selected as the global emissions option instead of CEDSv2 or EDGARv4.3. HTAPv3 is disabled by default.

Data processing scripts and validation information for this update are posted to GitHub. See issue geoschem/geos-chem #1301.

Option to archive species concentrations in molec cm^{-3}

GEOS-Chem 14.1.0 gives two options for archiving species concentrations via the HISTORY diagnostics, rather than just in molar mixing ratio.

1. `SpeciesConcVV`
    - Formerly called `SpeciesConc`
    - Molar mixing ratio (which also is the same as volume mixing ratio)
    - Units: `mol mol`$^{-1}$ `dry air`
2. `SpeciesConcMND`
    - Molecular number density
    - Units: `molec cm`$^{-3}$

By default, `SpeciesConcVV` will be activated and `SpeciesConcMND` will be deactivated in the `HISTORY.rc` file that ships with your GEOS-Chem run directory.

IMPORTANT! Once you begin using GEOS-Chem 14.1.0, you must replace `SpeciesConc` with `SpeciesConcVV` in your data analysis scripts. This will avoid "data not found" errors.

NetCDF satellite timeseries diagnostics replacing binary ND51

Joshua Shutter (UMN) has replicated the functionality of the ND51 binary punch ("bpch") satellite timeseries diagnostic in the GEOS-Chem Classic HISTORY diagnostics. This has allowed us to retire the ND51 binary diagnostics from GEOS-Chem Classic.

For implementation details, please see GitHub pull requests geoschem/geos-chem PR #1134 and geoschem/geos-chem PR #1478.

Cleanup of memory leaks

Bob Yantosca (Harvard) added a memory-leak checking capability (via the GNU Fortran compiler) to GEOS-Chem 14.1.0 and HEMCO 3.5.0. A memory leak occurs when a data array or pointer is allocated but not deallocated before a model simulation ends. Memory leaks can cause GEOS-Chem or HEMCO to use an increasing amount of memory during a simulation.

Using the new feature Bob identified and removed several significant memory leaks. For more information, please see Github pull request geoschem/geos-chem PR #1353.

Time-averaged file timestamps changed from midpoint time to start time

Users should be aware of an important change starting in GEOS-Chem 14.1.0. Time-averaged data fields archived with the GEOS-Chem Classic HISTORY diagnostics **are now timestamped with the start of the averaging interval instead of the midpoint.**

Consider the `GEOSChem.SpeciesConc.20190101_0000z.nc4` file. This file contains time-averaged fields (`SpeciesConcVV` and `SpeciesConcMND`) belonging to the `SpeciesConc` collection.. The **reference date/time** value is set to the start of the first averaging period in the file:

```
time:units = "minutes since 2019-01-01 00:00:00" ;
```

All time points in the file are measured with respect to this reference time.

In GEOS-Chem versions prior to 14.1.0, the first time point in the `SpeciesConc` collection file did not match up with the reference time, but was offset to the midpoint of the averaging interval. For January monthly mean output, this time slice would be:

```
time = "2019-01-16 12" ;
```

But we have now changed this behavior so that the first time point in the file uses the start of the averaging interval. This also means that the first time slice will always match the reference date/time:

```
time = "2019-01-01" ;
```

We made this change in order to make the GEOS-Chem Classic HISTORY diagnostics match the behavior of GCHP HISTORY diagnostics. **Users should take note of this change, especially when comparing GEOS-Chem 14.1.0 diagnostic data to diagnostic data from prior versions**.

GCHP tagged O3 simulation

We have ported the tagged O3 simulation to GCHP in GEOS-Chem 14.1.0. As always, we welcome members from the GEOS-Chem community to assist with the validation process.

MAPL updated to version 2.26.0

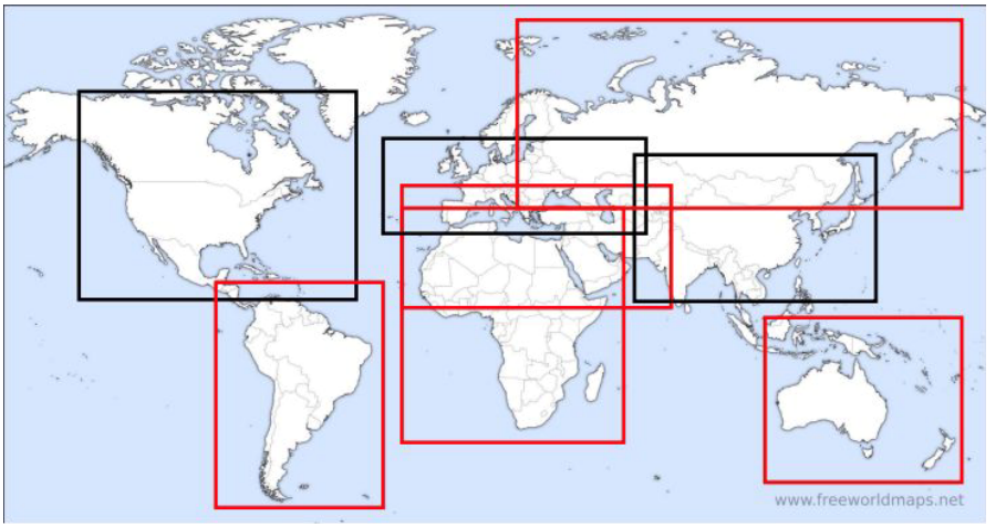
Lizzie Lundgren (Harvard) updated versions of the MAPL library and its dependencies in GCHP, upgrading MAPL from v2.18.3 to v2.26.0. Please note that MAPL 2.26.0 requires Earth System Modeling Framework (ESMF) version 8.1.0 or later.

This is a zero diff update for GCHP data output. However, it includes improved error handling and a new optional feature to input the ExtData config file as a YAML file. We plan to replace the GCHP config file `ExtData.rc` with `ExtData.yml` in a future GEOS-Chem version.

GEOS-FP met fields for additional nested-grid domains

Melissa Sulprizio (Harvard) has prepared cropped GEOS-FP met fields at 0.25° x 0.3125° horizontal resolution for several new nested-grid domains (see below). These data, which span the time period from 2019 through Nov 2022, may be downloaded from the WashU data server (http://geoschemdata.wustl.edu/ExtData/).

1. Africa (`GEOS_0.25x0.3125_AF`)
    - `LonMin=-20.0, LonMax=53.0, LatMin=-37.0, LatMax=40.0`
    - Size: 1300 GB
2. Middle East (`GEOS_0.25x0.3125_ME`)
    - `LonMin=-20.0, LonMax=70.0, LatMin=12.0, LatMax=44.0`
    - Size: 624 GB
3. Oceania (`GEOS_0.25x0.3125_OC`)
    - `LonMin=110.0, LonMax=180.0, LatMin=-50.0, LatMax=5.0`
    - Size: 959 GB
4. Russia (`GEOS_0.25x0.3125_RU`)
    - `LonMin=19.0, LonMax=180.0, LatMin=41.0, LatMax=83.0`
    - Size: 1500 GB
5. South America (`GEOS_0.25x0.3125_SA`)
    - `LonMin=-88.0, LonMax=-31.0, LatMin=-59.0, LatMax=16.0`
    - Size: 1100 GB



*Rough region boundaries

10-year benchmarks with GEOS-Chem 14.0.0

We recently completed 10-year benchmarks with GEOS-Chem 14.0.0.

Specialty simulations (e.g. CH4, Hg, tagO3, etc.) in GEOS-Chem 14.0.2 and later versions use oxidant fields, species concentrations, and related data that has been archived from the 10-year GEOS-Chem Classic benchmark.

All full-chemistry simulations in GEOS-Chem 14.0.2 and later use restart files created by the 10-year GEOS-Chem Classic benchmarks. Monthly restart files for 2010 through 2019 are available for initial conditions.

For more information on the 10-year benchmark simulation, including links to restart files and monthly mean model output, see the GEOS-Chem 14.0.0 wiki page.

2. Recent GEOS-Chem publications

Here is a list of GEOS-Chem publications appearing on Google Scholar since the last GEOS-Chem newsletter. We strongly recommend that you browse through this list to keep up-to-date with what is happening in the GEOS-Chem world that may be relevant to your research.

See the GEOS-Chem Publications Page on Google Scholar for a list that goes further back in time. This page is generously maintained by GEOS-Chem user **Gongda Lu**

(gongda.lu@ucl.ac.uk). If you find that any of your GEOS-Chem co-authored papers are missing from the Scholar page, please email Gongda with the title of the publication.

1. M.M. Kelp, M. Carroll, T. Liu, R.M. Yantosca, H.E. Hockenberry, L.J. Mickley, Prescribed burns as a tool to mitigate future wildfire smoke exposure: Lessons for states and rural environmental justice communities, submitted to AGU Advances, 2023.

2. Z. Chen, D.J. Jacob, R. Gautam, M. Omara, R.N. Stavins. et al., Satellite quantification of methane emissions and oil/gas methane intensities from individual countries in the Middle East and North Africa: implications for climate action, EGUSphere [preprint], 2023.

3. N.K. Colombi, D.J. Jacob, L.H. Yang, S. Zhai, V. Shah, S.K. Grange, R.M. Yantosca, S. Kim, H. Liao, Why is ozone in South Korea and the Seoul Metropolitan Area so high and increasing?, EGUsphere [preprint], 2023.

4. R.V. Martin, S.D. Eastham, L. Bindle, E.W. Lundgren, T.L. Clune, et al., Improved Advection, Resolution, Performance, and Community Access in the New Generation (Version 13) of the High Performance GEOS-Chem Global Atmospheric Chemistry Model (GCHP), Geosci. Model Dev., 15, 8731-8748, 2022.

5. T. Feng, H. Chen, J. Liu, Air pollution-induced health impacts and health economic losses in China driven by US demand exports, Journal of Environmental Management, 324, 116355, 2022.

6. H. Yin, Y. Sun, Y. You, J. Notholt, M. Palm, W. Wang, C. Shan, C. Liu, Using machine learning approach to reproduce the measured feature and understand the model-to-measurement discrepancy of atmospheric formaldehyde, Science of The Total Environment, 851, 158271, 2022.

7. T.M. Fritz, S.D. Eastham, L.K. Emmons, H. Lin, E.W. Lundgren, S. Goldhaber, et al., Implementation and evaluation of the GEOS-Chem chemistry module version 13.1.2 within the Community Earth System Model v2. 1, Geoscientific Model Development, 15 (23), 8669-8704, 2022.

8. Q. Guo, K. Zhang, B. Wang, S. Cao, T. Xue, Q. Zhang, H. Tian, P. Fu, J.J. Zhang, X. Duan, Chemical constituents of ambient fine particulate matter and obesity among school-aged children: A representative national study in China, Science of The Total Environment, 849, 157742, 2022.

9. A. Christiansen, L.J. Mickley, J. Liu, L.D. Oman, L. Hu, Multidecadal increases in global tropospheric ozone derived from ozonesonde and surface site observations: can models reproduce ozone trends?, Atmospheric Chemistry and Physics, 22 (22), 14751-14782, 2022.

10. W. .Swanson, C.D. Holmes, W.R. Simpson, K. Confer, L. Marelle, J.L. Thomas, et al., Comparison of model and ground observations finds snowpack and blowing snow aerosols both contribute to Arctic tropospheric reactive bromine, Atmospheric Chemistry and Physics. 22 (22), 14467-14488, 2022.

11. Y. Wang, N. Lin, W. Li, A. Guenther, J.C.Y. Lam, A.P.K. Tai, M.J. Potosnak, R. Secp, Satellite-derived constraints on the effect of drought stress on biogenic isoprene emissions in the southeastern US, Atmospheric Chemistry and Physics, 22 (21), 14189-14208, 2022.

12. V. Selimovic, D. Ketcherside, S. Chaliyakunnel, C. Wielgasz, W. Permar, et al., Atmospheric biogenic volatile organic compounds in the Alaskan Arctic tundra: constraints from measurements at Toolik Field Station, Atmospheric Chemistry and Physics, 22 (21), 14037-14058, 2022.

13. C.Y. Gao, C.L. Heald, J.M. Katich, G. Luo, F. Yu, Remote aerosol simulated during the Atmospheric Tomography (ATom) campaign and implications for aerosol lifetime, Journal of Geophysical Research: Atmospheres, e2022JD036524, 2022.

14. J. Yang, Y. Zhao, Performance and application of air quality models on ozone simulation in China---A review, Atmospheric Environment, 119446, 2022.

15. N. Kumar, J. Johnson, G. Yarwood, J.H. Woo, Y. Kim, R.J. Park, J.I. Jeong, et al., Contributions of domestic sources to PM2. 5 in South Korea, Atmospheric Environment, 287, 119273, 2022.

16. H. Vernier, N. Rastogi, H. Liu, A.K. Pandit, K. Bedka, A. Patel, M.V. Ratnam, et al., Exploring the inorganic composition of the Asian Tropopause Aerosol Layer using medium-duration balloon flights, Atmospheric Chemistry and Physics, 22 (18), 12675-12694, 2022.

17. H. Dai, H. Liao, K. Li, X. Yue, Y. Yang, J. Zhu, J. Jin, B. Li, Composited analyses of the chemical and physical characteristics of co-polluted days by ozone and PM2.5 over 2013-2020 in the Beijing-Tianjin-Hebei region, Atmospheric Chemistry and Physics Discussions, 1-40, 2022.

18. L. Qi, H. Zheng, D. Ding, S. Wang, Effects of Anthropogenic Emission Control and Meteorology Changes on the Inter-Annual Variations of PM2.5-AOD Relationship in China, Remote Sensing, 14 (18), 4683, 2022.

19. T.S. Carter, C.L. Heald, J.H. Kroll, E.C. Apel, D. Blake, M. Coggon, A. Edtbauer, et al., An improved representation of fire non-methane organic gases (NMOGs) in models: emissions to reactivity, Atmospheric Chemistry and Physics, 22 (18), 12093-12111, 2022.

20. S.J. Pai, C.L. Heald, H. Coe, J. Brooks, M.W. Shephard, E. Dammers, J.S. Apte, et al., Compositional Constraints are Vital for Atmospheric PM2.5 Source Attribution over India, ACS Earth and Space Chemistry, 2022.

21. L. Chen, J. Lin, R. Ni, H. Kong, M. Du, Y. Yan, M. Liu, J. Wang, H. Weng, et al., Historical transboundary ozone health impact linked to affluence, Environmental Research Letters, 2022.

22. H.M. Lee, R.J. Park, Factors determining the seasonal variation of ozone air quality in South Korea: Regional background versus domestic emission contributions, Environmental Pollution, 308, 119645, 2022.

23. L. He, B. Byrne, Y. Yin, J. Liu, C. Frankenberg, Remote-sensing derived trends in gross primary production explain increases in the CO2-seasonal cycle amplitude, Global Biogeochemical Cycles, e2021GB007220, 2022.

24. M. Moghani, C.L. Archer, Impacts of replacing coal with renewable energy sources and electrifying the transportation sector on future ozone concentrations in the US under a warming climate, Atmospheric Pollution Research, 101522, 2022.

25. L. Kuai, N.C. Parazoo, M. Shi, C.E. Miller, I. Baker, A.A. Bloom, K. Bowman, et al., Quantifying Northern High Latitude Gross Primary Productivity (GPP) Using Carbonyl Sulfide (OCS), Global Biogeochemical Cycles, 36, (PNNL-SA-168099), 2022.

3. GEOS-Chem Version Releases

The following GEOS-Chem versions have been released since the GEOS-Chem Newsletter 2022 Issue 2.

GEOS-Chem 14.0.2

Release Date: 19 May 2022

GEOS-Chem 14.0.2 contains the following fixes for issues discovered after the 14.0.1 release:

14.0.2 Feature	**Contributor(s)**
Update sample full-chemistry restart files to 10-year 14.0.0 benchmark output	Melissa Sulprizio (Harvard)
Bug fixes for CH4 simulations, including: • Update HEMCO_Config.rc to read EDGARv6 files with corrected timestamps • Update HEMCO_Config.rc to read Lakes files with corrected time unit • Restore analytical CH4 inversion option • Add fix for CH4 rice emissions	Melissa Sulprizio (Harvard) Ruosi Liang (ZhejiangU) Bob Yantosca (Harvard)
Fix indentation issue in geoschem_config.yml template files	Lucas Estrada (Harvard)
Fix units of RxnRate diagnostics in Get_Metadata_State_Diag routine	Bob Yantosca (Harvard)
Bug fix: Use proper KPP diagnostic flags in fullchem_mod.F90	Christoph Keller (GMAO)
Removed "dry air" text from metadata for State_Met%AIRVOL and State_Met%BXHEIGHT	Chris Holmes (FSU)

14.0.2 Feature	Contributor(s)
Bug fix: Only write dry-run header to the HEMCO.log file if HEMCO output is not already being sent to the stdout stream	Jiaying Yi (Nanyang Tech U) Bob Yantosca (Harvard)
Close GEOS-Chem Classic restart files immediately after writing data to them	Chris Holmes (FSU) Bob Yantosca (Harvard)
Improve error messages encountered when reading the HEMCO configuration file	Bob Yantosca (Harvard)
Remove memory leaks from GEOS-Chem and HEMCO code (NOTE: this also includes updating to HEMCO 3.5.2)	Bob Yantosca (Harvard)
Updates and bug fixes for CESM, including enabling GEOS-Chem diagnostics	Haipeng Lin (Harvard) Lizzie Lundgren (Harvard)

GEOS-Chem 14.0.1

Release Date: 26 Oct 2022

GEOS-Chem 14.0.1 contained several fixes for issues that were discovered during the 14.0.0 benchmarking process. GEOS-Chem 14.0.0 and 14.0.1 were released concurrently.

14.0.1 Feature	Contributor(s)
Fix typo for AEIC 2019 entries in HEMCO_Config.rc for aerosol-only simulations	Charley Fite (FSU)
Fix units metadata for State_Met%PHIS and State_Met%AirNumDen	Charley Fite (FSU) Bob Yantosca (Harvard)
Update Restart collection in HISTORY.rc to include BXHEIGHT and TROPLEV for all simulations	Melissa Sulprizio (Harvard)
Fix typo preventing ND51 satellite diagnostic from turning on	Melissa Sulprizio (Harvard)
Fix deallocation error in non-local PBL mixing vdiff_mod.F90	Haipeng Lin (Harvard)
Fix incorrect non-species data in GCHP mid-run checkpoint files	Lizzie Lundgren (Harvard)
Set species concentration arrays as pointers to internal state in GCHP	Lizzie Lundgren (Harvard)
Documented and cleaned up GCHP run script operational examples	Lizzie Lundgren (Harvard)

GEOS-Chem 14.0.0

Release Date: 26 Oct 2022

GEOS-Chem 14.0.0 contained the following updates:

14.0.0 Feature	Contributor(s)
Update to HEMCO 3.5.0	Haipeng Lin (Harvard) Lizzie Lundgren (Harvard) Melissa Sulprizio (Harvard) Bob Yantosca (Harvard)
Fix bugs causing differences when splitting up GC-Classic and GCHP simulations in time	Lizzie Lundgren (Harvard)
Remove unnecessary met-fields from GC-Classic restart file that caused incorrect initial meteorology	Lizzie Lundgren (Harvard)
Fix GC-Classic pressure fixer bug causing high ozone bias over poles in 13.4 global simulations	Lizzie Lundgren (Harvard)
Fix dry deposition of methanol over oceans	Lizzie Lundgren (Harvard) Kelvin Bates (Harvard)
Add missing entries for POG and pFe in HEMCO_Config.rc	Charley Fite (FSU) Melissa Sulprizio (Harvard)
Updated offline biogenic VOC emissions	Hongjian Weng (PKU)
Updated offline soil NOx emissions	Hongjian Weng (PKU)
Replace input.geos with geoschem_config.yml	Bob Yantosca (Harvard)
Rebuilt chemistry mechanisms with KPP 2.5.0	Bob Yantosca (Harvard)
Change 4D State_Chm%Species array to vector of 3D concentration arrays	Lizzie Lundgren (Harvard)
Fix to save boundary conditions on first timestep	Eloise Marais (UCL)
Fix bug in total OC diagnostic	Lizzie Lundgren (Harvard)
Avoid div-by-zero in routine MMR_Compute_Flux	Bob Yantosca (Harvard)

14.0.0 Feature	**Contributor(s)**
Minor HEMCO updates, including: • Strip tabs from HEMCO configuration file • Change default diagnostic counter warning level • Add fixes for generating HEMCO standalone run directory	Bob Yantosca (Harvard) Lizzie Lundgren (Harvard) Melissa Sulprizio (Harvard)
Fix compilation errors with the KPP/custom mechanism	Lixu Jin (U. Montana) Bob Yantosca (Harvard)
Bug fixes for the Hg simulation via KPP	Ari Feinberg (MIT) Viral Shah (GMAO) Bob Yantosca (Harvard)
Updates for GEOS from GMAO	Christoph Keller (GMAO)
Updates for GEOS-Chem and HEMCO in CESM	Thibaud Fritz (MIT) Lizzie Lundgren (Harvard) Haipeng Lin (Harvard)
Updates for GEOS-Chem in WRF-GC	Haipeng Lin (Harvard)
Bug fix: Remove duplicate SO4 in the KPP aciduptake.eqn file	Tomas Sherwen (York)
Bug fix: Update HEMCO_Config.rc file to read newer CEDS data for the CO2 specialty simulation	Bob Yantosca (Harvard)
Bug fix in run directory creation for simulations with GCAP2 meteorology	Lee Murray (U. Rochester)
Automated GEOS-Chem user registration (at first-time run directory creation)	Lucas Estrada (Harvard)
Upgrade GMAO libraries in GCHP	Liam Bindle (WUStL) Lizzie Lundgren (Harvard)
Add option to use native GEOS-FP met fields in GCHP	Liam Bindle (WUStL)
Run directory updates to easily break up GCHP runs in time	Lizzie Lundgren (Harvard)
Bug fixes for MEGAN HEMCO extension	Lizzie Lundgren (Harvard)
Vertical Mass Flux Diagnostic to be Scaled By 1/Dt	Liam Bindle (WUStL)
Bug fix: Fix typo in path for Volcano_Table in GCHP run directory creation	Killian Murphy (York)

14.0.0 Feature	Contributor(s)
Bug fix: GCHP run directories incorrectly used MERRA2 if selecting GEOS-FP	Liam Bindle (WUStL)

4. Model development priorities

GEOS-Chem 14.2.0

The GEOS-Chem Steering Committee, with input from the Working Groups, have identified the following model development items as priorities for inclusion into GEOS-Chem 14.2.0:

1. Methane emissions from hydropower reservoirs (Daniel)
2. Alk4 & R4N2 chemistry (Daniel)
3. Update reactions with JPL & IUPAC recommendations (Daniel)
4. KORUSv5 inventory option (Daniel, Katie)
5. Nitrate photolysis (Daniel)
6. I_y sink and SSA debromination (Becky)
7. Global continental chlorine (pCl and HCl) emissions (Becky)
8. Update surface methane boundary condition (Lee)
9. CEDS emission inventory at 0.1 degree resolution (Randall)

Other updates slated for inclusion into GEOS-Chem

The GEOS-Chem Steering Committee regularly assigns priority of new science features for inclusion into GEOS-Chem. Please view our Model Development Priorities wiki page to view a list of prioritized updates as of this writing. The current list reflects priorities that were assigned at the IGC10 meeting in June 2022.

We encourage you to bring new GEOS-Chem developments to the attention of the relevant Working Group Chair(s) for addition to the model development priorities list.

5. Steering Committee News

Notes from the most recent Steering Committee meeting

The GEOS-Chem Steering Committee met on **18 January 2023**. We invite you to read the meeting minutes as well as the following related presentations:

- Update from the Aerosols Working Group

- Update from the Stratosphere Working Group
- Updates from other working groups
    - Hg and POPs Working Group
    - Transport Working Group

The 2nd GEOS-Chem Europe Meeting (GCE2)

Eloise Marais (UC London) and **Mat Evans** (U York) have announced that the **2nd GEOS-Chem Europe meeting (GCE2) will take place in London, UK from August 16-18, 2023**. We hope to bring you more information about the meeting in the coming weeks.

Thanks for your continued support of GEOS-Chem!
Happy modeling!

The GEOS-Chem Support Team:
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