

# **GEOS-Chem Support Team Activities**

**Bob Yantosca ~ GC Model Engineer ~ IGC8 ~ 01 May 2017**



**Bob Yantosca  
(Harvard)**



**Melissa Sulprizio  
(Harvard)**



**Lizzie Lundgren  
(Harvard)**



**Mike Long  
(Harvard)**



**Colin Thackray  
(Harvard)**



**Junwei Xu  
(Dalhousie)**



**Yanko Davila  
(CU Boulder)**

# What we work on

GCST Member	Affiliation	Projects
Bob Yantosca	Harvard	Software development and validation User support and documentation GCHP development and support Project management
Melissa Sulprizio	Harvard	Software development and validation User support and documentation Benchmarking new GC versions
Lizzie Lundgren	Harvard	GCHP development and support Software development and validation User support and documentation Benchmarking new GC versions
Colin Thackray	Harvard	Specialty simulation development (e.g. Hg, POPs)
Mike Long (based in NC)	Harvard	GCHP development and support Integrating GC into Earth System Models
Junwei Xu	Dalhousie	Processing GMAO met data for input into GC; data archiving GCHP testing
Yanko Davila	Colorado Univ. @ Boulder	GC Adjoint development and validation GC Adjoint documentation and training GC Adjoint user support

Honorary members: Seb Eastham and Jiawei Zhuang (GCHP development and support)

# GCST supports the International GC User Community



## User support

- Helping new users to get started with GC
- Assisting GC users in debugging their simulations
- Developing supporting software
  - GCPy : Visualization & regridding (to replace GAMAP)
- Distributing met fields & other data for input into GC



## Source code management

- Accepting new GC science updates from the community
- Enforcing version control with Git
- Maintaining public code repositories (on Bitbucket.org)
- Facilitating traceability for all updates made to GC
  - Documenting new features and bug fixes on the GC wiki



## Documentation, communication, & education

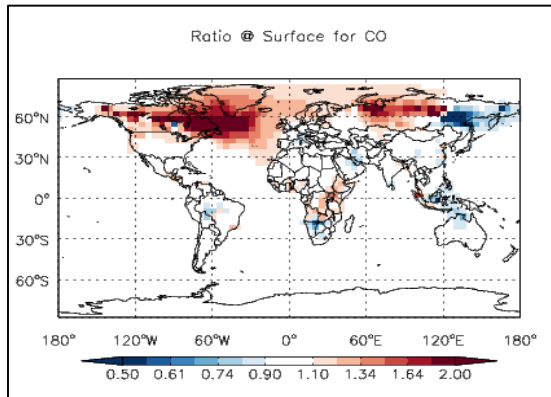
- GC Web Site, Wiki, and Online User's Manual
- GC Adjoint wiki pages
- Quarterly e-Newsletters
- GC email lists (e.g. [geos-chem@g.harvard.edu](mailto:geos-chem@g.harvard.edu))

# GCST preserves the scientific integrity of GC



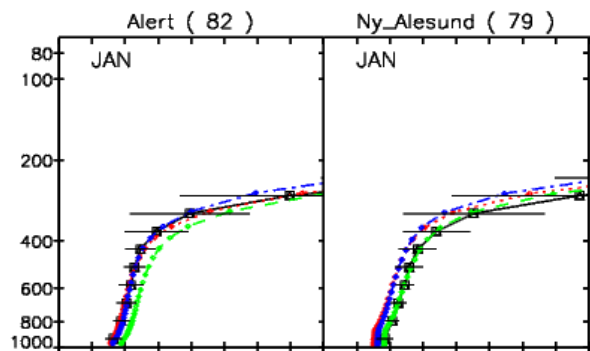
## Ensuring code correctness

- Fixing bugs as soon as they are reported
- Performing automatic code validation tests:
  - Unit tests scan for common coding errors
  - Difference tests make sure structural changes do not change any scientific results



## 1-month benchmark simulations

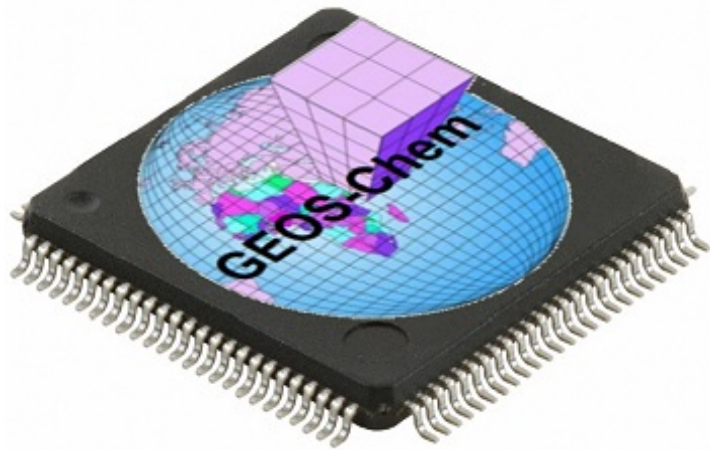
- Tropchem+UCX+SOA, 4x5 GEOS-FP met, for July 2013
- Submitted after each new feature is added to GC
- Compared to prior 1-month benchmark
- GCSC, developers, and interested users analyze and comment on benchmark results
- Final approval is by Model Scientist



## 1-year benchmark simulations

- Tropchem+UCX+SOA, 4x5, GEOS-FP met for year 2013
- Submitted before each public release of GC (or sooner)
- Compared to prior 1-year benchmarks + observations
- Approval process same as for 1-month benchmarks

# GCST develops the next generation of GC



## High-performance computing (HPC)

- Interfacing GC into Earth System Models (ESMs)
  - NASA GEOS5-DAS
  - Beijing Climate model
  - CESM (soon!)
- GCHP development and support
  - Benchmarking and scientific validation
  - Improving the GCHP user experience / easier compilation
  - Adding new GCHP documentation
  - Engaging the GCHP user community
- Cooperative development with NASA/GMAO
  - GEOS-CTM effort (A. Molod)
  - MAPL software library development (T. Clune et al)
  - Developing a library of chemical modules for GEOS5-DAS



## Improving the efficiency and usability of GC

- Making GC compatible with open-source gfortran compiler
  - Which facilitates running GEOS-Chem “in the cloud”
- Providing options for speeding up GC simulations
  - Changing time steps, flexible precision, etc.
- Overhauling diagnostics for netCDF output

# For more information

## During IGC8

- Model Clinic: “GC for Beginners”
- Model Clinic: “GC for Advanced Users”
- Model Clinic: “GC Adjoint”
- Model Clinic: “GCHP”
- Model Clinic: “GC interfaced into ESMs”
- GCST Office Hours:

TODAY @ 12:15 PM

TODAY @ 12:45 PM

TODAY @ 5:15 PM

Tuesday @ 12:45 PM

Wednesday @ 12:45 PM

TODAY thru Wednesday 1:30 – 3:00 PM

## Anytime

- GC Web Site
- GC Wiki
- GC Adjoint

[www.geos-chem.org](http://www.geos-chem.org)

[wiki.geos-chem.org](http://wiki.geos-chem.org)

[wiki.geos-chem.org/GEOS-Chem\\_Adjoint](http://wiki.geos-chem.org/GEOS-Chem_Adjoint)

## Contact us

- GCST email address
- GC Adjoint email list

[geos-chem-support@as.harvard.edu](mailto:geos-chem-support@as.harvard.edu)

[geos-chem-adjoint@g.harvard.edu](mailto:geos-chem-adjoint@g.harvard.edu)