GEOS–Chem User Resources, Code Development Guidelines, and Debugging Tips

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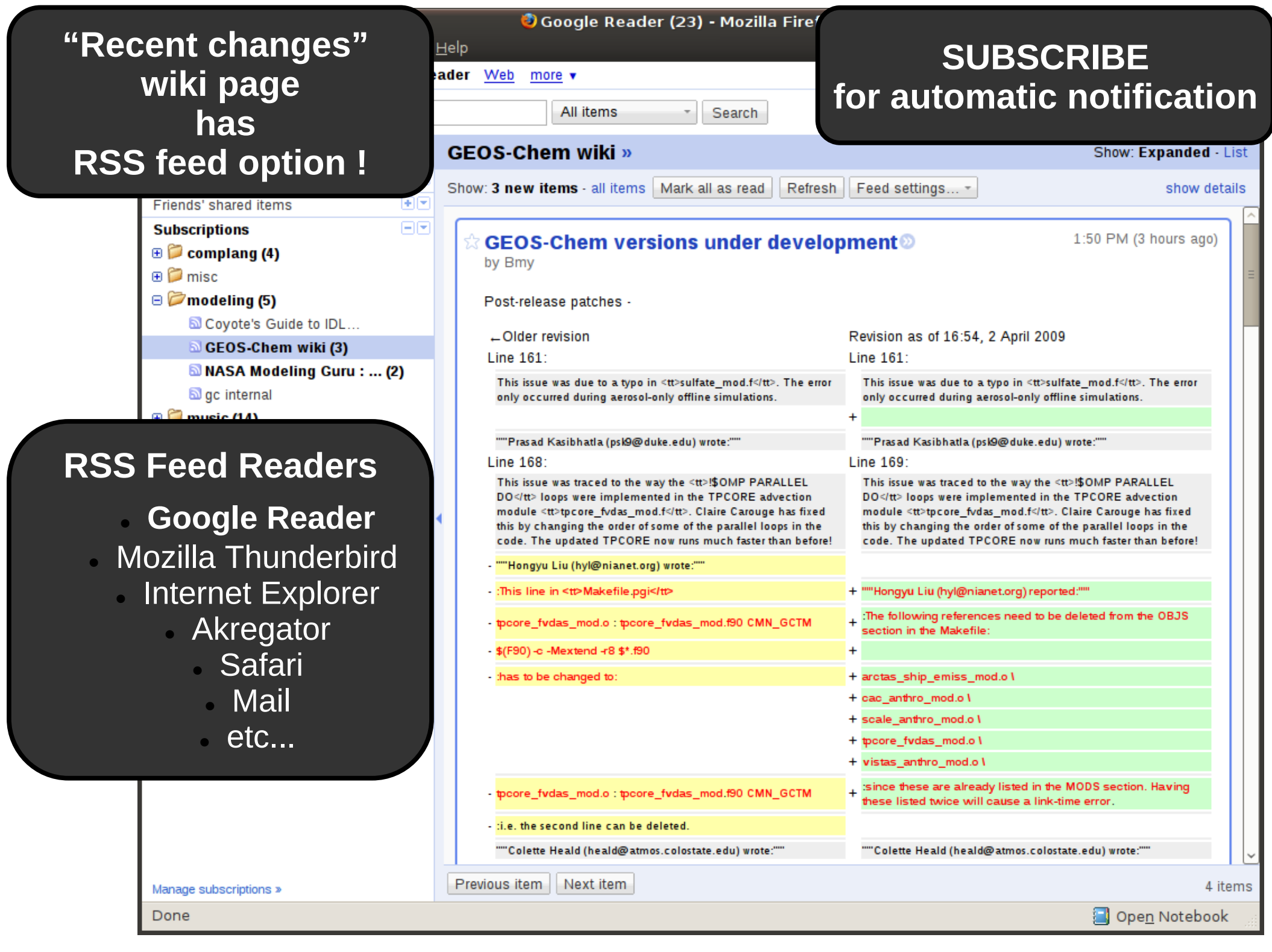
GEOS–Chem User Resources

Subscribe to the GEOS–Chem wiki

- The wiki facilitates communication among GEOS–Chem users and developers. ***It is the first place you should look for info!***
- The wiki contains information about
  - GEOS–Chem versions and benchmark simulations
  - Monthly informational newsletters
  - Bugs, fixes, and machine issues
  - Emissions options and chemistry mechanism
  - Offline simulations
  - Met fields
  - Adjoint simulations
  - GAMAP
- Create a login and password, then you can edit pages
  - Wiki URL: ***http://wiki.seas.harvard.edu/geos-chem/***


"Recent changes" wiki page has RSS feed option !
SUBSCRIBE for automatic notification
RSS Feed Readers
Google Reader
Mozilla Thunderbird
Internet Explorer
Akregator
Safari
Mail
etc...
Google Reader (23) - Mozilla Fire
Help
ader Web more
All items
Search
GEOS-Chem wiki »
Show: Expanded - List
Show: 3 new items - all items
Mark all as read
Refresh
Feed settings...
show details
Friends' shared items
Subscriptions
complang (4)
misc
modeling (5)
Coyote's Guide to IDL...
GEOS-Chem wiki (3)
NASA Modeling Guru : ... (2)
gc internal
GEOS-Chem versions under development
by Bmy
1:50 PM (3 hours ago)
Post-release patches -
←Older revision
Revision as of 16:54, 2 April 2009
Line 161:
This issue was due to a typo in <tt>sulfate_mod.f</tt>. The error only occurred during aerosol-only offline simulations.
"""Prasad Kasibhatla (psk9@duke.edu) wrote:"""
Line 168:
Line 169:
This issue was traced to the way the <tt>!$OMP PARALLEL DO</tt> loops were implemented in the TPCORE advection module <tt>tpcore_fvdas_mod.f</tt>. Claire Carouge has fixed this by changing the order of some of the parallel loops in the code. The updated TPCORE now runs much faster than before!
"""Hongyu Liu (hyl@nianet.org) wrote:"""
:This line in <tt>Makefile.pgi</tt>
tpcore_fvdas_mod.o : tpcore_fvdas_mod.f90 CMN_GCTM
$(F90) -c -Mextend -r8 $*.f90
:has to be changed to:
"""Hongyu Liu (hyl@nianet.org) reported:"""
:The following references need to be deleted from the OBJS section in the Makefile:
arctas_ship_emiss_mod.o \
cac_anthro_mod.o \
scale_anthro_mod.o \
tpcore_fvdas_mod.o \
vistas_anthro_mod.o \
:since these are already listed in the MODS section. Having these listed twice will cause a link-time error.
:i.e. the second line can be deleted.
"""Colette Heald (heald@atmos.colostate.edu) wrote:"""
Manage subscriptions »
Previous item
Next item
4 items
Done
Open Notebook

GEOS–Chem User Resources

Subscribe to the GEOS–Chem email lists

GEOS-Chem Email List	Intended Audience
geos-chem@seas.harvard.edu	All GEOS-Chem users Version updates and bug fixes will be announced via this list!!
geos-chem-adjoint@seas.harvard.edu	Adjoint Working Group
geos-chem-aerosols@seas.harvard.edu	Aerosols Working Group
geos-chem-carbon@seas.harvard.edu	Carbon Gases and Organics Working Group
geos-chem-emissions@seas.harvard.edu	Emissions Working Group
geos-chem-oxidants@seas.harvard.edu	Oxidants and Chemistry Working Group
geos-chem-regional@seas.harvard.edu	Regional Air Quality Working Group

To subscribe to any of these lists, visit: https://lists.seas.harvard.edu/mailman/listinfo

GEOS–Chem User Resources

GEOS–Chem web page and user manuals

- GEOS–Chem web page, contains
  - Recent publications and presentations
  - Information about GEOS–Chem user groups
  - Information about parallelization and coding style
  - Links to programming resources (e.g. F90 tutorials, HDF info, etc.)
  - Links to various types of GEOS–Chem output
  - And more...
- User manuals
  - GEOS–Chem Users' Guide
  - GAMAP Users' Guide
  - GEOS–Chem Style Guide
  - TESTRUN

GEOS–Chem Code Development

GEOS–Chem Steering Committee

- The charge of the GEOS–Chem Steering Committee is to:
  - Develop long-term strategies for the model and for the functioning of the user community
  - Prioritize and enable model development
  - Facilitate sharing of information across model users through the GEOS–Chem Working Groups.

- GEOS–Chem Steering Committee membership
  - Is rotating (fixed-length terms)
  - Is international

GEOS–Chem Code Development

GEOS–Chem Working Groups

- Each Working Group focuses on a particular area of research
  - Adjoint Model and Data Assimilation
  - Aerosol Processes
  - Carbon Gases and Organics
  - GMAO Liaison
  - Emissions
  - Oxidants and Chemistry
  - Regional Air Quality
- Responsibilities of each Working Group:
  - To foster communication between Working Group members for collaboration and sharing of information
  - To facilitate identification of model development priorities.

GEOS–Chem Best Practices

1. GEOS–Chem is a grass-roots community model that relies on contributions and good practices from all its users for continued successful operation. These practices include:
2. Identifying yourself to model engineer Bob Yantosca and providing a link to your research for the People and Projects web page
3. Subscribing to model and working group email lists, keeping up to speed through the model newsletters and wiki pages
4. Providing credit to recent developers in publications
5. Contributing bug reports and fixes to the GEOS-Chem support team
6. Upgrading regularly to the latest standard version of the model
7. Helping out as you can in response to user requests
8. Contributing mature new developments to the standard model

GEOS–Chem Code Development

Criteria for including updates into GEOS–Chem

- Each update to G–C must have an identifiable user base
  - This ensures that all new functionality that is added into GEOS–Chem will benefit the largest possible number of users
  - If an update to GEOS–Chem has no readily identifiable user base, it will be assigned a lower priority and/or left as a research option
  - Code developers should interact with the relevant Working Group(s) to prioritize and coordinate updates for inclusion into GEOS–Chem

- Each update to GEOS–Chem must be mature and stable
  - Ready to be plugged in (i.e. no major rewriting needed)
  - Well-documented source code and data files
  - If necessary, provide results for comparison
    - E.g. for tagged and/or offline simulations

GEOS–Chem Code Development

Who supports what?

- Bob, Philippe, and Claire (aka B/P/C) support GEOS–Chem's "full-chemistry" simulation (NOx – Ox – HC's – Aerosols)
  - 1 month & 1 year benchmark simulations
  - User manual on the GEOS–Chem website … etc
- The GEOS–Chem user community is responsible for the upkeep and validation of other simulations, including:
  - Offline tagged Ox
  - Offline tagged CO
  - Offline tagged aerosols
  - Offline CH4
  - Mercury
  - Nested grid simulations, … etc.
- Users should provide B/P/C with updates for offline simulations, for inclusion into the GEOS–Chem standard code

GEOS–Chem Code Development

GEOS–Chem user responsibilities

- GEOS–Chem users are responsible for:
  - Setting up their hardware systems (w/ help of local IT if possible!)
  - Learning F90, IDL, shell scripts, etc...
  - Periodically updating to the latest version of G–C
    - i.e. at the start of a new project
  - Debugging code
  - Joining the Working Group(s) most relevant to their area(s) of research
- Promptly report any bug fixes you have made to B/P/C
  - Other users may be struggling w/ the same problem and could benefit from the fix that you have made
- Code submission guidelines
  - When any code you have written is mature, submit it to B/P/C for inclusion into the GEOS–Chem std code.
  - Also provide the appropriate documentation

GEOS–Chem Code Development

Documentation: Do's

- Please provide copious comments in your code
  - List the name and purpose of each module, subroutine, and function
  - Label each input/output argument and its units
  - Provide citations to journal references where appropriate
  - Use descriptive names for variables, subroutines, functions
  - Clearly identify your modifications in the code using your initials
- For data that is meant as input to GEOS–Chem, provide:
  - A README file describing:
    - Individual data files and their contents (and units!!)
    - Source of the data and any journal references
    - The FTP/web site from which the data was obtained
  - Plots, tables and/or sums of emissions data
  - IDL/F90 etc. code that was used to create individual data files
- Feel free to post documentation for code & data on the wiki!

GEOS–Chem Code Development

Documentation: Don'ts

- Don't use a language other than English
- Avoid partial citations such as:
  - “see Smith & Jones, 2001”
  - “see Smith's paper”
  - “see Amanda's slide”
  - List the full citation first, then abbreviate thereafter...
- Avoid cryptic comments
  - e.g. “NOx 1.2, Ox 2.0”
- Don't assume that the person reading your documentation will have any prior knowledge about this code and/or data
  - Leave nothing unexplained!

GEOS–Chem Code Development

Automatic documentation with ProTeX

- Protex is a very useful Perl script (developed @ GSFC) that can strip information from a Fortran document header and save that to a LaTeX file.
- The LaTeX file can then be converted to PDF, PS, HTML formats
- We strongly recommend all new GEOS–Chem code be equipped with ProTeX documentation headers!
- GEOS–Chem v8-01-03 and higher now uses ProTeX
- Please see the following Wiki page for more information:

  http://wiki.seas.harvard.edu/geos-chem/index.php/Automatic_documentation_with_protex

Debugging / Testing Tips

Use GEOS-Chem utilities

- **CHECK_STT** if NaN or a negative tracer appears
- **SAFE_DIV** to avoid potential overflow (division by zero)
- **IS_SAFE_DIV** to check both overflow & underflow in division
- **CHECK_VALUE** to check for NaN or INFINITY

Look for numerical traps

- "**catastrophic cancellation**" when subtracting huge and small
- use **F90 utilities**

  TINY to get a small positive number
- compile with **warnings** on

  check bounds, check uninit, check pointers (ifort)

Debugging / Testing Tips (2)

Use a Debugger

- F90 -> Totalview, dbx, GDB
- IDL, Matlab -> included

Report a bug

- Use this address: ***geos-chem-support@as.harvard.edu***
- Please provide this information:
  - GEOS-Chem version number & Type of Simulation
  - Met field type & horizontal resolution (e.g. 4 x 5 GEOS–5)
  - Platform, Compiler, Number of Processors
  - Description of problem
  - Log file output from the simulation w/ the error message
  - ***Important! Have you made any changes to the standard code?***

Debugging / Testing Tips (3)

Some Useful Resources:

- *Floating-point math issues* page on the GEOS-Chem wiki
  - Brief description of how floating-point math works
  - How to avoid some common numerical pitfalls
  - ***http://wiki.seas.harvard.edu/geos-chem/index.php/Floating_point_math_issues***
- *Programming resources* page on GEOS–Chem website
  - Links to tutorials, compiler sites & manuals, and other information
  - ***http://www.as.harvard.edu/ctm/geos/geos_resources.html***