GCHP working group summary

Jiawei Zhuang
GCA1
05/23/2018

Important updates since IGC8 (available in v11-02)

1. **NetCDF diagnostics fully available** (Bob Yantosca)
   - Exactly the same interface as GC-classic ("HISTORY.rc" file)
   - Output on cubed-sphere grid
     - Regrid to lat-lon for easy analysis
     - Or directly analyze cubed-sphere data

2. **GNU Fortran compiler compatibility** (Seb Eastham)
   - Most components (chemistry, convection, etc.) are as fast as with Intel Fortran
   - Advection (GFDL-FV3) is 2x slower than with Intel Fortran
   - The entire model is ~20% slower

3. **GCHP on cloud** (Jiawei Zhuang)
   - Currently runs in a single node (with at most 72 cores)
   - Will work on parallelization across nodes

Usability improvements (in v11-02)

1. **More documentation** (Lizzie Lundgren)
   - http://wiki.seas.harvard.edu/geos-chem/index.php/GEOS-Chem_HP

2. **More meaningful debugging messages** (Seb Eastham)
   - Set ”debug level” in “CAP.rc”

3. **Simplify configuration files** (Lizzie Lundgren)
   - Use “runConfig.sh” instead of many different config files

4. **Cleaner code structure** (Lizzie Lundgren)
   - No more specialized “GCHP” branch in GC-classic repository

   (i.e. standard GC-classic code + GCHP subfolder = complete GCHP)

Short-term plans (in v11-03)

1. **Improve I/O efficiency** (Lizzie Lundgren)
   - Update MAPL (GCHP's infrastructure) to newer version

2. **Offline archive of resolution-dependent emissions** (Jintai Lin)
   - Facilitate resolution sensitivity study
   - Online calculation still available (e.g. to study meteorological impact)

3. **Benchmark scripts in Python** (Lizzie Lundgren, Jiawei Zhuang)
   - Cubed-sphere regridding and plotting
   - Can be a reference for users to analyze GCHP data

4. **Convection scheme from GEOS-5** (Karen Yu, Bob Yantosca)
   - "Relaxed Arakawa–Schubert (RAS) scheme"
   - Address resolution dependence of vertical transport

Bigger questions

1. Cubed-sphere data archive from GMAO

- Decide what variables to archive
- Host new data on AWS cloud

2. Grid-independence in the vertical

- Read metfields from other models (CESM, GISS model-E, …)
- Facilitate scientific studies (plume transport, etc.)

3. More clearly define the role of GCHP

- GCHP as a way to run global high-resolution simulations? Almost finished.
- Or, GCHP as a complete replacement of GC-classic? GCHP-nested will be an engineering pain, due to over-complicated structure of MAPL.

User-specific issues

1. Specialty simulations
2. Memory leak on specific machines
3. Hardware-specific optimizations

…