CMAQ Tutorials

CMAQ Benchmark Case

CMAQv5.1 is distributed with a complete set of input files required for running the CCTM. These data provide useful examples of the input files needed to run the CCTM. They can also be used to benchmark new installations of the software. Benchmarking refers to a simulation that is used to verify that the software is installed correctly and is recommended in the following circumstances:

- Installation on a new server
- Following kernel upgrades
- Following Fortran compiler upgrades
- Following netCDF or I/O API library upgrades

This tutorial assumes you have already downloaded, installed, and compiled the CMAQ model on your server. For further instructions on those processes, see: (http://www.airqualitymodeling.org/cmaqwiki/index.php?title=CMAQv5.1_Readme_file#Tutorial.2FBenchmark_Simulation_Instructions)

STEP 1: Download CMAQ Benchmark Data

Download CMAQ benchmark input data by navigating to https://www.cmascenter.org/ and logging into the site using the "Log In" shortcut on the horizontal menu. After logging in, click the "Software" pulldown menu on the horizontal menu bar and choose "CMAQ". Click "DOWNLOAD" on the right-hand side of the page and choose the correct version, platform, and compiler for your machine and click submit. Choose the Base Model release package. This page will display links for the source code, benchmark data and utilities. Choose the CMAQ benchmark input data (zip file is 1.5 Gb) and CMAQ benchmark output data (zip file is 5.3 Gb).

STEP 2: Place Data in CMAQ directory

The benchmark tar files work with the existing CMAQ directories. Download the data onto your serve and follow these commands to place the benchmark data in the correct CMAQ directory. Navigate to the directory: CMAQv5.1/scripts and perform these commands:

```
source config.cmaq

cd $M3HOME

cd ..

mv /path/to/input/DATA.CMAQv5.1.Nov2015.tar.gz .

mv /path/to/output/DATA_REF.CMAQv5.1.Nov2015.tar.gz .

tar -zxvf DATA.CMAQv5.1.Nov2015.tar.gz

tar -zxvf DATA_REF.CMAQv5.1.Nov2015.tar.gz
```

These steps should have placed eleven directories containing the input data into $M3HOME/data/ and the output data into five directories within $M3HOME/data/ref/.

STEP 3: Run benchmark script

The script has been specifically tailored to run the benchmark case, therefore no other modifications are needed. Use the following commands to run the benchmark script:

```
cd $M3HOME/scripts/cctm

run.cctm |& tee run.benchmark.log
```

STEP 4: Confirm successful simulation of benchmark

To confirm that the benchmark case ran successfully, with your text editor of choice, view the run.benchmark.log file. A successful run should contain the following line at the bottom of the log:

```
>>----> Program completed successfully <----<<
```

The benchmark output results will have been placed in $M3DATA/cctm/ and should include fifteen netCDF-type files (i.e., ACONC, AERODIAM, AEROVIS, B3GTS_S, CGRID, CONC, DEPV, DRYDEP, MEDIA_CONC, PHOTDIAG1, PHOTDIAG2, SOILOUT, SSEMIS, WETDEP1, and WETDEP2).

STEP 4: Evaluate benchmark results

To determine if your benchmark case successfully simulated on your server, use the provided benchmark output to compare. Provided are the expected output for the boundary conditions (BCON), cmaq chemical transport model (CCTM), initial conditions (ICON), photolysis rate processor (JPROC), and process analysis preprocessor (PROCAN).

Use your netCDF evaluation tool of choice to evaluate your benchmark results. For example, Verdi (https://www.cmascenter.org/verdi/) is a useful tool to evaluate CCTM results.

Note: Common errors occur due to incorrect paths to netCDF and I/O API libraries, and those are a good place to start if the benchmark case does not run successfully.