GMI Status Report, Part I:
Completed Simulations, Ready for Science
November 9, 2005

The GMI core team has completed many different simulations with the tropospheric, stratospheric, and combo CTMs in the past few months. The purpose of this report is to make you aware of what's available right now for analysis. Also, you will find a list of recent GMI submitted or accepted publications at the end.

All output is available through anonymous ftp to dirac.gsfc.nasa.gov.

> 'cd' to /pub/gmidata and don't forget to
> type 'passive' (so you can 'ls' and 'get').

Contact Bigyani Das (bdas@calvin.gsfc.nasa.gov) or Susan Strahan (strahan@code916.gsfc.nasa.gov) for details on where to find specific outputs.

Version 2 Tropospheric Model Simulations

- Two year simulations using DAO, fvgcm, and GISS met fields were completed in May. This is a 4x5 degree model. The GISS simulation uses the layer adjustment for the cloud optical depth (previously off by 1 level).

- Simple tracer simulations (CH_3I, CO-anthropogenic, CO-Biomass burning, and CO_2) have also been completed for each of these met fields. These simulations are useful for transport analysis in support of both the tropospheric chemistry and the aerosol runs.

- Additional station output for NARE-SONEX is available.

- In addition to these full chemistry runs, quite a few sensitivity tests have been conducted. These may be useful in the interpretation of the chemistry runs. These experiments include:

a) Sensitivity to definition of tropopause. Currently we use synoz=150. Simulations were also run at synoz=100 and synoz=200 with fvgcm met fields.
b) The effect of stratospheric ozone to the troposphere (i.e., no synoz contribution to tropospheric ozone). Available for fvgcm, DAO, and GISS.
c) Sensitivity of tropospheric chemistry to cloud optical thickness (GISS only)
d) The effect of seasonally-varying anthropogenic CO emissions (DAO, fvgcm, and GISS).
e) Sensitivity to tropospheric CH_4 (a fixed field)
f) 1870 "pre-industrial" surface emissions

Version 2 Aerosol Model Simulations

- Two year simulations using DAO, fvgcm, and GISS met fields were completed in May and June. This is a 4x5 degree model. The GISS simulation uses the layer adjustment for the cloud optical depth (previously off by 1 level). These simulations use inputs for OH, HO2, NO3, O3, and J-H2O2 that come from Michigan (not GMI tropospheric runs – see below).

- Analogous to the 2-year simulations above, we DAO, fvgcm, and GISS simulations that use GMI tropospheric model output (with the corresponding met fields) as inputs to the aerosol model. An analysis of these simulations has been submitted for publication (see list at end).

- Two year simulations using 1870 "pre-industrial" emissions using DAO, GISS, and fvgcm met fields were integrated at the request of Xiaohong Liu/Joyce Penner. The chemical inputs for these simulations came from the GMI tropospheric model run with pre-industrial emissions. There were two types of experiment: a) 'pre-industrial emissions and pre-industrial sulfur, and b) 'pre-industrial emissions and present-day sulfur.

Version 2 Combo (combined strat-trop chemistry) Model Simulations

- The combo model has been run at 4x5 resolution with 5 years of fvgcm met data reprocessed to 42 levels (lid at 0.015 hPa). (The met fields have been reprocessed at 2x2.5 resolution also, but that 5-year simulation is not yet complete.) Five-year Radon/lead simulations have been completed for both resolutions.

- Bryan Duncan has made several additions to the combo to bring its troposphere up to par with the GMI (V2) tropospheric model. He has included the effect of clouds, tropospheric aerosols, and uv-albedo (surface-varying, rather than fixed at 0.3) on the calculated photolysis rates (using Fast-JX). The stratospheric chemistry was updated to JPL2002 with help from Jules Kouatchou. 'Inactive' species were removed from the mechanism, as per the GEOS-CHEM mechanism. Output is written for 110 chemically active species (117 total, including N2, O2, dehyd, etc).

Stratospheric Model (33 levels)

- The 'hindcast' simulations, consisting of two 50-year runs for the period 1975-2025, are available. Source gas boundary conditions come from the WMO A2 scenario. One run is the 'hindcast warm', which has a repeating warm Arctic winter. The other is 'hindcast cold', which has a repeating cold (high PSC) Arctic winter. The model resolution is 2^{o}x2.5^{o} x 33 levels (lid at 0.015 hPa).

- Based on conversations with Ross Salawitch, we ran a 5-year simulation using a ‘hindcast cold’ restart file (Jan. 1, 2000) with an additional 8 ppt of CH3Br. Because CH3Br is short-lived in the lower stratosphere, this is an easy way to test the effect of an additional 6-8 ppt of Bry on polar ozone loss.

GMI or GMI-related manuscripts

Xiaohong Liu, Joyce E. Penner, Bigyani Das, et al., Uncertainties in global aerosol simulations: Assessment using three meteorological datasets, *J. Geophys. Res., submitted*, August, 2005.

D. B. Considine, D.J. Bermann, and H. Liu, Sensitivity of Global Modeling Initiative chemistry and transport model simulations of radon-222 and lead-210 to input meteorological data, Atmos. Chem. Phys. Discuss., 5, 5325-5372, 2005.

S.E. Strahan and B.C. Polansky, Implementation issues in chemistry and transport models, Atmos. Chem. Phys. Discuss., 5, 10,217-10,258, 2005.

D.S. Stevenson, F.J. Dentener, M.G. Schultz, and a cast of thousands, Multi-model ensemble simulations of present-day and near-future tropospheric ozone, *J. Geophys. Res., accepted*, 2005.