

Date: June 7, 2018.

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Article: " Development and implementation of a new biomass burning emissions injection height scheme for the GEOS-Chem model"

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Abstract:

Biomass burning is a significant source of trace gases and aerosols to the atmosphere, and the evolution of these species depends acutely on where they are injected into the atmosphere. GEOS-Chem is a chemical transport model driven by assimilated meteorological data that is used to probe a variety of scientific questions related to atmospheric composition, including the role of biomass burning. This paper presents the development and implementation of a new global biomass burning emissions injection scheme in the GEOS-Chem model. The new injection scheme is based on monthly gridded Multi-Angle Imaging Spectro Radiometer (MISR) global plume-height stereoscopic observations in 2008. To provide specific examples of the impact of the model updates, we compare the output from simulations with and without the new MISR-based injection height scheme to several sets of observations from regions with active fires. Our comparisons with ARCTAS aircraft observations show that the updated injection height scheme improves the ability of the model to simulate the vertical distribution of peroxyacetyl nitrate (PAN) and carbon monoxide (CO) over North American boreal regions in summer. We also compare a simulation for October 2010 and 2011 to vertical profiles of CO over the Amazon Basin. When coupled with larger emission factors for CO, a simulation that includes the new injection scheme also better matches selected observations in this region. Finally the improved injection height also

improves the simulation of monthly mean surface CO over California during July 2008, a period with large fires.

Description:

This repository contains two files:

One is the 4-D emitted fraction based on the MISR plume observations in 2008 gridded as $2^\circ \times 2.5^\circ$ horizontal resolution and GEOS-5 reduced vertical resolution. As there is no emitted fraction above 29 GEOS-5 levels, the file includes 29 vertical levels. The emitted fractions are averaged by month. Thus, the matrix dimension is $144 \times 91 \times 29 \times 12$. It is saved as a netcdf file: **"fire_injheight_GEOS_Chem_c20170404.nc"**

The other one is the modification of a GEOS-Chem fortran module. This module reads in the file above and applies the emitted fractions to the corresponding grid cells. This module is a part of the larger GEOS-Chem model. The name of the code(module) is "setemis.F".

Sponsors:

- This work was supported by NASA Award Numbers NNX14AF14G and NNX14AN47G.
- PAN data from ARCTAS was provided by Greg Huey supported by NASA Award Number NNX08AR67G.
- Amazon vertical profile data were provided by L.V. Gatti supported by NERC (NE/F005806/1) and FAPESP (08/58120-3).
- The authors thank Glenn Diskin for the use of the ARCTAS CO data.
- The authors thank Paul C. Novelli for the use of the CO data from NOAA ESRL Carbon Cycle Cooperative Global Air Sampling Network