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14 Jul 2014

HEMCO v1.0: a versatile, ESMF-compliant component for calculating emissions in atmospheric models

C. A. Keller¹, M. S. Long¹, R. M. Yantosca¹, A. M. Da Silva², S. Pawson², and D. J. Jacob¹

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Abstract. We describe the Harvard–NASA Emission Component version 1.0 (HEMCO), a stand-alone software component for computing emissions in global atmospheric models. HEMCO determines emissions from different sources, regions, and species on a user-defined grid and can combine, overlay, and update a set of data inventories and scale factors, as specified by the

user through the HEMCO configuration file. New emissions inventories at any spatial and temporal resolution are readily added to HEMCO and can be accessed by the user without any preprocessing of the data files or modification of the source code. Emissions that depend on dynamic source types and local environmental variables such as wind speed or surface temperature are calculated in separate HEMCO extensions.

HEMCO is fully compliant with the Earth System Modeling Framework (ESMF) environment. It is highly portable and can be deployed in a new model environment with only few adjustments at the top-level interface. So far, we have implemented HEMCO in the NASA Goddard Earth Observing System (GEOS-5) Earth system model (ESM) and in the GEOS-Chem chemical transport model (CTM).

By providing a widely applicable framework for specifying constituent emissions, HEMCO is designed to ease sensitivity studies and model comparisons, as well as inverse modeling in which emissions are adjusted iteratively. The HEMCO code, extensions, and the full set of emissions data files used in GEOS-Chem are available at <http://wiki.geos-chem.org/HEMCO>.

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