Geophysical Research Abstracts
Vol. 16, EGU2014-5234, 2014
EGU General Assembly 2014

Global fire emission estimates (2007-2012) derived from inversion of formaldehyde columns

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Wildfires have a strong impact on the chemistry and composition of the atmosphere and the radiative forcing. The fire emission estimates bear, however, important uncertainties due to the limited amount of field measurements, uncertainties in satellite burned area products, as well as empirical relations used for fuel type allocations. Atmospheric inversions are an alternative approach that provides new independent constraints on the fire estimates. This method involves measurements of trace gases combined with atmospheric models, where optimization algorithms are used to minimize the discrepancy between the model and the observations by adjusting the emission estimates.

In this communication, we present global emission estimates of non-methane volatile organic compounds (NMVOCs), inferred from inversion of formaldehyde (HCHO) columns retrieved from the Global Ozone Monitoring Experiment-2 (GOME-2) instrument (De Smedt et al., 2012). The IMAGESv2 global CTM provides the relationship between the emissions and the vertical columns. The Global Fire Emissions Database version 3 (GFEDv3, van der Werf et al., 2010) is used as a priori bottom-up inventory in the model. The agreement between formaldehyde columns calculated by the IMAGESv2 model and the formaldehyde columns from GOME-2 is optimized using the adjoint modelling technique (Stavrakou et al., 2009). The obtained top-down fire emission estimates between 2007 and 2012 are available at the GlobEmission data portal (http://www.globemission.eu) on a monthly basis and at 0.5°x0.5° spatial resolution.

The emission estimates are evaluated against three independent emission inventories: GFEDv3 (van der Werf et al., 2010), GFAS (Kaiser et al., 2012) and FINN (Wiedinmyer et al., 2011). Furthermore, simulated CO columns over the fire-affected regions will be compared with CO columns retrieved from the IASI sensor (George et al., 2009).