Geophysical Research Abstracts
Vol. 20, EGU2018-4280, 2018
EGU General Assembly 2018

The South American atmosphere : high-resolution inversion of OMI formaldehyde abundances using the adjoint of the MAGRITTE regional model

Maite Bauwens (1), Trissevgeni Stavrakou (1), Jean-François Müller (1), Isabelle De Smedt (1), Michel Van Roozendael (1), Xiaoyan Jiang (2), and Alex Guenther (2)

(1) BIRA - IASB, Brussels, Belgium (maiteb@oma.be), (2) Department of Earth System Science, University of California, Irvine, CA, 92697

South America is an interesting, though challenging region in terms of atmospheric chemistry. The Amazonian rainforest is the largest source of isoprene emissions globally and a region prone to large fire episodes during the dry season. This region is however relatively unexplored, partly due to the inaccessibility of the Amazon forest resulting in the current scarcity of ground-based measurements. The photo-oxidation of the large majority of hydrocarbons released in the atmosphere through vegetation and biomass burning lead to formation of formaldehyde (HCHO) at high yields. Satellite observations of HCHO can thereby inform us on the magnitude and spatiotemporal variability of the emitted parent hydrocarbons of biogenic and pyrogenic origin.
Here we use the regional chemistry-transport model MAGRITTE and its adjoint to study the atmospheric composition and its evolution, and constrain the emissions of isoprene and biomass burning over 2010-2015 in a domain delimited as 15N-35S, 32-85W. MAGRITTE runs at 0.5x0.5 degree horizontal resolution and uses boundary conditions from simulations using the IMAGESv2 global model (Bauwens et al. 2016, Stavrakou et al. 2016). The regional and global models share the same chemical mechanism, emissions and physical parameterizations. Anthropogenic emissions are taken from the HTAPv2.2 database for 2010 (Janssens-Maenhout et al. 2015), except for VOC emissions for which we use the EDGARv4.3.2 database and its speciation (Huang et al. 2017). Wildfires are obtained from the GFED4 database (van der Werf et al. 2017) and biogenic emissions from the MEGAN-MOHYCAN model (Guenther et al. 2012, Bauwens et al. 2017).
Monthly observations of HCHO obtained from the OMI spectrometer will be used to constrain the inversion. The aim of this work is to infer improved 'top-down' estimates of emissions fluxes and in particular to investigate (i) the seasonality and interannual variability of biogenic emissions over the Amazon, (ii) the impact of soil moisture stress according to the new MEGAN3 soil moisture stress parameterization (Jiang et al. 2017), and (iii) the intensity of biomass burning fluxes during fire events, in particular for extremely dry years like 2010.