Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02548, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02548
EGU General Assembly 2008


# Net ecosystem fluxes of isoprene over tropical South America inferred from GOME observations of HCHO columns

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We show top-down isoprene emissions over tropical South America during 1997–2001 inferred from column measurements of formaldehyde (HCHO) from the Global Ozone Monitoring Experiment (GOME) satellite instrument, the GEOS-Chem chemistry transport model and the MEGAN (Model of Emissions of Gases and Aerosols from Nature) bottom-up isoprene inventory. MEGAN is qualitatively consistent with in situ ground-based and aircraft concentration profiles of isoprene and HCHO, and GOME HCHO column data (r =0.41; bias = +35%), but has generally less skill in reproducing observations in the wet season. Observed variability of GOME HCHO columns over South America is determined largely by biogenic VOCs and biomass burning. HCHO columns significantly influenced by biomass burning are removed using ATSR firecounts and GOME $NO_2$ columns. We find that South America can be split into eastern and western regions, with fires concentrated over the eastern region. Consequently, we use GOME to directly derive isoprene emissions over western South America, and then use the GOME estimates to constrain the emissions over the eastern areas. A monthly mean linear transfer function, determined by GEOS-Chem, is used to infer isoprene emissions from observed HCHO columns. We find that the column contributions from other biogenic VOCs are typically smaller than the column fitting uncertainty. The seasonal variation of GOME isoprene emissions over the western region is broadly consistent with MEGAN (r=0.41; bias=25%), with largest isoprene emissions during the dry season when the observed variability is consistent with prior knowledge of temperature dependence. During the wet season, other unknown factors play a significant role in determining observed variability. We also show the impact of

using the lower top-down isoprene emissions on surface and column concentrations of CO, $NO_x$, $O_3$and PAN.