Geophysical Research Abstracts
Vol. 17, EGU2015-5229, 2015
EGU General Assembly 2015

Response of the Amazon carbon balance to the 2010 drought derived with CarbonTracker South America

Ingrid van der Laan-Luijkx (1), Ivar van der Velde (1), Maarten Krol (1,2,3), Luciana Gatti (4), John Miller (5,6), Manuel Gloor (7), Thijs van Leeuwen (2,3,8), Johannes Kaiser (9), Christine Wiedinmyer (10), Sourish Basu (5,6), Cathy Clerbaux (11), Wouter Peters (1,12)

(1) Wageningen University, Meteorology and Air Quality, Wageningen, Netherlands (ingrid.vanderlaan@wur.nl), (2) Institute for Marine and Atmospheric Research Utrecht, Utrecht University, Utrecht, the Netherlands, (3) SRON Netherlands Institute for Space Research, Utrecht, the Netherlands, (4) Instituto de Pesquisas Energéticas e Nucleares (IPEN), Divisão de Química Ambiental, São Paulo, Brazil, (5) Global Monitoring Division, Earth System Research Laboratory, National Oceanic and Atmospheric Administration (NOAA), Boulder, Colorado, USA, (6) Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, Colorado, (7) School of Geography, University of Leeds, Leeds, United Kingdom, (8) Faculty of Earth and Life Sciences, VU University Amsterdam, Amsterdam, the Netherlands, (9) Max Planck Institute for Chemistry, Mainz, Germany, (10) National Center for Atmospheric Research, Boulder, CO, USA, (11) UPMC University Paris 06, Université de Versailles Saint-Quentin-en-Yvelines, CNRS/INSU, LATMOS-IPSL, Paris, France, (12) Centre for Isotope Research, University of Groningen, Groningen, the Netherlands

Two major droughts in the past decade had large impacts on carbon exchange in the Amazon. Recent analysis of vertical profile measurements of atmospheric CO_2 and CO by Gatti et al. [2014] suggests that the 2010 drought turned the normally close to neutral annual Amazon carbon balance into a substantial source of nearly 0.5 PgC/yr, revealing a strong drought response. In this study, we revisit this hypothesis and interpret not only the same CO_2/CO vertical profile measurements, but also additional constraints on carbon exchange such as satellite observations of CO, burned area, and fire hotspots. The results from our CarbonTracker South America data assimilation system suggest that carbon uptake by vegetation was indeed reduced in 2010, but that the magnitude of the decrease strongly depends on the estimated 2010 and 2011 biomass burning emissions. Using fire products based on burned area (GFED4), satellite observed CO columns (IASI), fire radiative power (GFASv1) or fire hotspots (FINNv1), lead to estimates of the 2010-2011 increase in biomass burning emissions between 0.16 and 0.43 PgC/yr. We derived a decrease of biospheric uptake ranging from 0.08 to 0.26 PgC/yr, with the range determined from a set of alternative inversions using different biomass burning estimates. Our numerical analysis of the 2010 Amazon drought results in a total reduction of carbon uptake of 0.24 to 0.50 PgC/yr and turns the balance from carbon sink to source. Our findings support the suggestion that the hydrological cycle will be an important driver of future changes in Amazonian carbon exchange.