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Airborne measurements reveal large spatial and seasonal methane flux differences across Amazonia

John Miller (1,2), Luciana Gatti (3), Emmanuel Gloor (4), Luana Basso (3), Alexandre Martinewski (3), Lucas Domingues (3), Humberto Rocha (5), and Jon Lloyd (4)

(1) NOAA/ESRL, Boulder, USA (John.B.Miller@noaa.gov), (2) CIRES, University of Colorado, Boulder, USA, (3) Insituto Pesquisas Energeticas e Nucleares, Sao Paulo, Brazil, (4) Dept. of Geography, University of Leeds, Leeds, UK, (5) IAG, University of Sao Paulo, Sao Paulo, Brazil

Using CH4 observations made aboard aircraft above Santarem (SAN) and Manaus (MAN) between 2000 - 2010 and 2004 - 2008, respectively, and during 2010 at three other aircraft sites throughout the Brazilian Amazon, we calculate surface fluxes at regional scales. We use a column budgeting technique in which our aircraft vertical profile measurements are referenced to a baseline calculated from a weighted average of background observations on the coast of Brazil and in the tropical Atlantic. Results from ten years of data from SAN reveal strong flux seasonality for the eastern part of the basin. We observe very high methane fluxes in the early part of the wet season (January and February) likely due to increased wetland emissions and slightly lower fluxes through the rest of the wet season. Fluxes during the end of the dry season (November and December) exhibit an increase relative to the earlier part of the dry season, which results from biomass burning as seen from enhancements in co-measured carbon monoxide. In the rest of the basin, wet season fluxes in 2010 are about one quarter of those for the eastern sector (as sampled at SAN), and in general do not exhibit the strong seasonality seen at SAN. Additionally, dry season fluxes for the rest of the basin during the biomass burning season are also significantly lower, despite large enhancements of CO during these times. In the annual mean, we have identified the eastern Amazon as a methane emissions hotspot with fluxes on average about three times higher than for the rest of the basin. Still, the rough average we calculate from our observations for the Brazilian Amazon is roughly 20 mg CH4/m2/day, which extrapolated over the 5 million km2 corresponds to nearly 40 Tg CH4/year. In our presentation, we will examine the possible reasons for the strong difference in CH4 flux between the eastern and rest of Amazonia and additionally compare our in situ-derived fluxes to complementary remote sensing and model-based estimates.