

Seasonality and inter-annual variability of CH₄ fluxes from the eastern Amazon Basin inferred from atmospheric mole fraction profiles

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The Amazon Basin is an important region for global CH₄ emissions. It hosts the largest area of humid tropical forests, and around 20% of this area is seasonally flooded. In a warming climate it is possible that CH₄ emissions from the Amazon will increase both as a result of increased temperatures and precipitation. To examine if there are indications of first signs of such changes we present here a 13-year (2000-2013) record of regularly measured vertical CH₄ mole fraction profiles above the eastern Brazilian Amazon, Santarém (SAN; 2.86°S; 54.95°W). Since 2000 samples are collected, fortnightly, aboard light aircraft between 300m and 4.4km. Using a simple mass balance approach, we find substantial CH₄ emissions with an annual average flux of 52.8±6.8 mg CH₄ m⁻² day⁻¹. We found a clear seasonality, with higher fluxes in two periods of the year: in the beginning of the wet season and during the dry season. Using a CO:CH₄ emission factor estimated from the profile data, we estimated an influence of biomass burning around 15% of the total flux in dry season, indicating that biogenic emissions dominate the CH₄ flux. This 13-year record shows that CH₄ emissions upwind of SAN varied over the years, with highest emissions in 2008 (around 25% higher than in 2007), mainly during the wet season, representing 19% of the observed global increase.

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