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Temporal variations of CH₄/CO₂/CO fluxes in the central Amazon rainforest

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Amazon rainforests and soils contain large amounts of carbon, which is under pressure from ongoing climate and land use change in the Amazon basin. It is estimated that methane (CH₄), an important greenhouse gas, is largely released from the flooded wetlands of the Amazon, but the trends and balances of CH₄ in the Amazon rainforest are not yet well understood. In addition, the change in atmospheric CH₄ concentration is strongly associated with a change in carbon monoxide (CO) concentration, often caused by the human-induced combustion of biomass that usually peaks during dry season. Understanding the long-term fluctuations in the fluxes of greenhouse gases in the Amazon rainforest is essential for improving our understanding of the carbon balance of the Amazon rainforest.

Since March 2012, we have continuously measured atmospheric CO₂/CH₄/CO concentrations at five levels (79, 53, 38, 24, and 4 m a.g.l.) using two wavelength-scanned cavity ring-down spectroscopy analyzers (G1301 and G1302, Picarro Inc., USA), which are automatically calibrated on site every day. In addition, we measured the CO₂ flux by the eddy covariance method at the same tower. We estimated the CO₂/CH₄/CO fluxes by combining the vertical profile of the CO₂/CH₄/CO concentrations with the flux gradient method. Our results generally show no major difference in CO₂ flux between the wet and dry seasons except for year 2017, when an elevated CO₂ uptake was documented during the dry season despite the lowest precipitation between 2014 and 2018. The CH₄ flux showed the largest CH₄ emission during the dry season in year 2016. Further results will be analyzed and discussed in the presentation.