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Six-year record (2012-2018) of atmospheric CO_2/CH_4/CO mixing ratios at the Amazon Tall Tower Observatory site (ATTO, Brazil) - interannual variability and footprint characterisation

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Interannual variations in the global atmospheric carbon dioxide (CO_2) growth rate are significantly influenced by fluctuations of carbon fluxes in tropical land areas such as the Amazon forest, which is subject to recurring droughts, rising temperatures and deforestation. Methane (CH_4) has large natural sources in Amazon's wetlands, as well as from biomass burning, a prominent source of carbon monoxide (CO) as well.

Our long-term record of atmospheric trace gases at the Amazon Tall Tower Observatory site (ATTO, Brazil; 2˚08'S, 59˚00'W; www.attoproject.org) has an unprecedented high temporal resolution and is therefore providing valuable insights into local and regional trace gas budgets.

Since March 2012, we run continuous high-precision CO_2/CH_4/CO measurements at the 80 m walk-up tower, with sample air inlets installed at five levels (79, 53, 38, 24, and 4 m a.g.l.). Two frequently calibrated CRDS analysers (G1301 and G1302; Picarro Inc., USA) are used for measuring CO_2/CH_4 and CO/CO_2, respectively.

In this work, we present a six-year (2012-2018) record of CO_2, CH_4 and CO atmospheric mixing ratios, highlighting the main features of their interannual variability and diurnal cycles. Because we measure close to the ground and the canopy ($\sim$ 35 m a.g.l.), the atmospheric signal is also influenced by local sources and sinks, providing insights into local ecosystem dynamics in addition to information on large-scale atmospheric circulation. We performed a climatological analysis of the footprint area at different heights, which is relevant for current and future greenhouse gas measurements. Finally, based on these footprint analysis we describe the major characteristics of the surface influence based on the areas of higher sensitivity.