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Regional variability in Amazon methane emissions based on lower-troposphere observations

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After a period where atmospheric methane (CH₄) levels were nearly steady, its levels have been rapidly raising since 2007, but the main reasons remains uncertain. Increases in wetlands emissions could be one possible reason, mainly at tropical regions like Amazonia, which host some of the largest wetlands/seasonally flooded areas on the globe. Based on 590 lower troposphere vertical profiles of CH₄ and carbon monoxide (CO) observations over four sites at Amazon (at the northeast, southeast, northwest-central and southwest-central regions) we estimated that Amazon region contributes with 8% of global CH₄ emissions, and wetlands are the mainly CH₄ source to the atmosphere (Basso et al., 2021). Vertical profiles are sampled using light aircraft, high-precision greenhouse gas and CO analysis of flask air, fortnightly between 2010 and 2018. We observed an unexpected east-west gradient in CH₄ emissions, with higher emissions in northeast Amazon region. The higher emissions are mainly from wetlands and are not explained by biomass burning and anthropogenic emissions (like enteric fermentation), but its causes remains unclear. In the other three sites located further downwind along the main air-stream the CH₄ emissions represents approximately 24-36% of what is observed in the northeast region. Our wetlands emission estimates of each region were compared to analogous fluxes from the WetCharts wetland model ensemble (Bloom et al., 2017). The estimates were similar except for the northeast region, where WetCharts does show substantial emissions, but still just 40% of our estimates based on the lower troposphere observations (Basso et al., 2021).