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Quantifying deposition pathways of Ozone at a rainforest site (ATTO) in the central Amazon basin

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Direct eddy covariance flux measurements of O_3 in tropical forests are sparse and deposition velocities of O_3 for tropical forest have large uncertainties in models. Therefore, we measured O_3 fluxes at different heights (4 m, 12 m, 46 m and 81 m), which is 2 levels within canopy (below crown layer) and two levels above. At the same levels heat and CO_2 fluxes were measured by eddy covariance to differentiate upper canopy fluxes from understory and soil fluxes and to infer stomatal conductance based on the inverted Penman-Monteith equation. Further measurements include the profiles of O_3, NO_x, CO_2 and H_2O which are used to calculate storage fluxes and reactions of O_3 with NO_x within the air volume. Additionally, leaf surface temperature and leaf wetness were measured in the upper canopy (26 m) to infer their influence on the non-stomatal deposition. The measurements took place at the ATTO (Amazon Tall Tower Observatory) site that is located about 150 km northeast of the city of Manaus in the Amazon rainforest. (02°08'38.8"S, 58°59'59.5"W). The climate in this region is characterized by a rainy (350 mm around March) and a dry season (ca. 80 mm in September). During the wet months, the air quality is close to pristine, while strong pollution from biomass burning is evident in the dry season. Therefore, we will present results from two intensive campaigns (3- 4 flux levels) for the rainy season (March to May) and the dry season (September to December) 2018.

The focus of the analysis is the partitioning between a) the crown layer and understory and b) stomatal and non-stomatal deposition with a further analysis of the non-stomatal pathways. Non-stomatal deposition is analyzed by quantifying gas-phase reactions of O_3 with NO_x and an estimate of O_3 reactivity by VOCs. Furthermore, the remaining (surface) deposition is analyzed according to its relations with leaf surface temperature and leaf wetness.