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REACTIVE AND NON-REACTIVE TRACE GAS EXCHANGE WITHIN AND ABOVE AN AMAZONIAN RAINFOREST

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ABSTRACT

In 2011 the currently highest atmospheric research tower of Amazonia was erected at the ATTO site (02°08'38,8''S, 58°59'59,5''W) (whereas ATTO stands for *Amazon Tall Tower Observatory*), which is monitoring concentration gradients regarding 5 trace gases (H_2O, CO_2, O_3, NO, NO_2) from 8 different heights between 0,05 m and 79,3 m, which enables the possibility to get new results regarding transport processes in and above the canopy. Never before there have been made profile measurements up to that height in the Amazonian rainforest.

RESUMO

Em 2011, a torre mais alta de toda Amazônia foi erguida no sitio ATTO (*Amazon Tall Tower Observatory)* (02°08'38,8''S, 58°59'59,5''W), com a finalidade de se fazer medidas atmosféricas. Nessa pesquisa estão sendo monitoradas as concentrações de 5 gases traços (H_2O, CO_2, O_3, NO, NO_2), em 8 níveis diferentes, entre 0,05 e 79,3 metros. Isso possibilitará encontrar novos resultados relacionados a processos de transporte dentro e acima do dossel. Até agora não foram feitas medidas de perfilamento até estas alturas na floresta Amazônica.

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INTRODUCTION

Emissions of gases with lifetimes shorter than the transport time from their source to a measurement site can´t be detected anymore at that site, so the further a place is away from (anthropogenic) trace gas sources, the less of those substances the atmosphere contains there. The inner Amazonia is one of the last places on earth where some reactive trace gas concentrations still exhibit preindustrial levels.

Ozone (O_3) plays a central role regarding chemical reactions within the NO-NO_2-O_3 triad and within many further oxidation processes including different trace gases and various surfaces. Naturally produced mainly inside the stratosphere, the tropospheric O_3-concentrations are strongly influenced by anthropogenic NO_x-emissions. In the inner Amazonia studies in nearly natural O_3-concentrations can lead to a deeper understanding of trace gas transports, deposition and subsequent (environmental) effects.

Related to transport processes from the higher troposphere and even the lower stratosphere until ground levels, downdraft events could exhibit a specific role. It has been detected some distinctive nighttime increase in O_3-levels due to downward transports during the *Wet Season Atmospheric Mesoscale Campaign* (WETAMC) in Ouro Preto d'Oeste in Rondonia [Betts, 2002]. One objective of this research is the detection and analysis of similar events at the ATTO site. Due to different topographic properties and meteorological regimes between the two regions, distinctive differences regarding vertical atmospheric transport processes are expected.

MATERIALS AND METHODS

Figure 1 displays an overview of the gradient system, containning 3 trace gas analyzers, inlets, pumps, valve block and data storage unit as well as a heated tube system. Additionally there was installed a drying unit, which avoids effects due to humidity oscillations.

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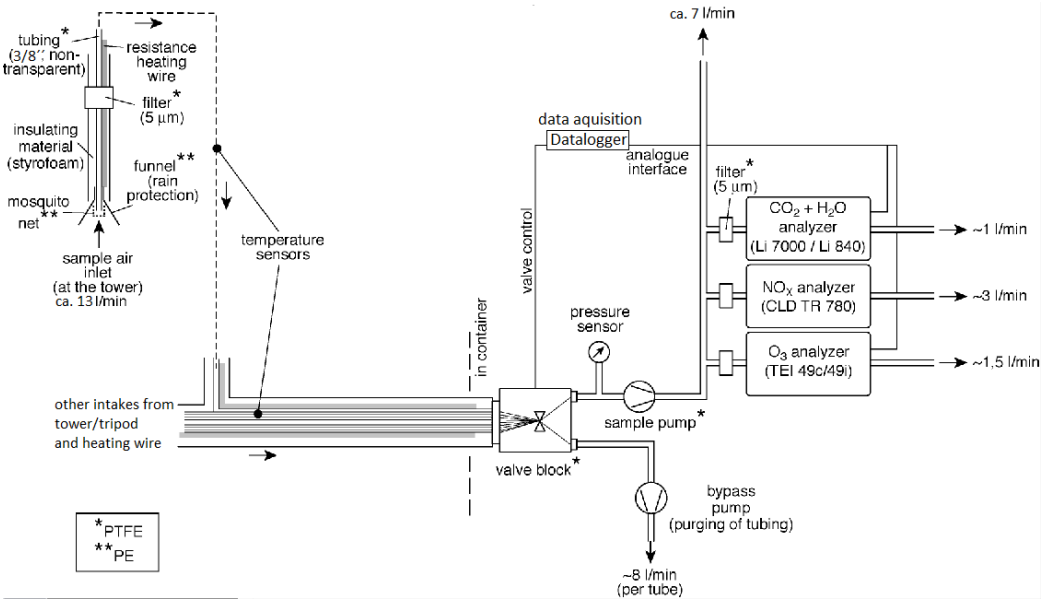

Fig. 1: Profile system with inlets and analyzers [courtesy of A. Moravek]

FIRST RESULTS

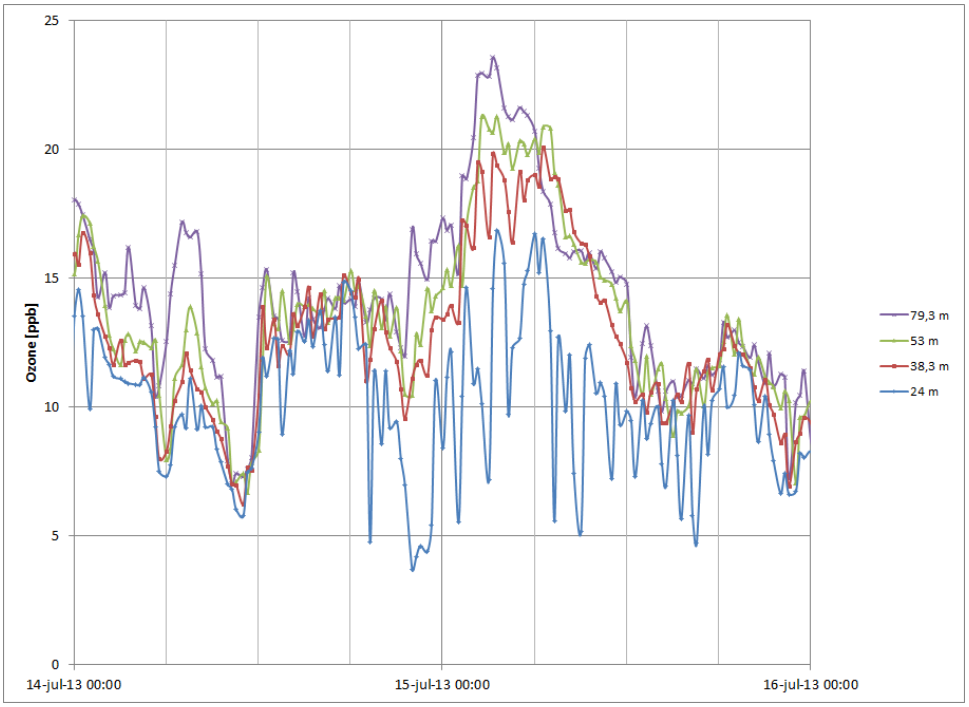

Fig. 2: Ozone profile at the ATTO-site between 14/07/13 and 16/07/13

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Figure 2 displays an example for a nighttime increase in O_3-concentrations especially above the canopy. Those events will be analyzed in detail with the help of various further parameters like equivalent potential temperature θ_e, flux data and meteorological measurements.

CONCLUSIONS

The first results already represent O_3-gradients and courses including several nighttime increases which will be analyzed concerning strong vertical transport processes and effects.

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