Tropical forest CH4: from flux chambers to micrometeorological tower measurements

Hella van Asperen1, Thorsten Warneke1, Alessandro Carioca de Araújo2,3, Bruce Rider Forsberg4, Leonardo Ramos de Oliveira2, Thiago de Lima Xavier2, Marta de Oliveira Sá2, Paulo Ricardo Teixeira2, Robson Azevedo de Oliveira2, Veber Sousa de Moura2, Leila do Socorro Monteiro Leal2,3, Santiago Botía4, Jošt Lavrič5, Shujiro Komiya5, Arnoud Frumau6, Arjan Hensen6, Pim van den Bulk6, Danielle van Dinther6, and Justus Notholt1

1University of Bremen, Institute of Environmental Physics (IUP), Remote Sensing, Bremen, Germany (vasperen@iup.physik.uni-bremen.de)
2Instituto Nacional de Pesquisas da Amazônia (INPA), Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA), Manaus, Brazil
3Brazilian Agricultural Research Corporation (EMBRAPA), Embrapa Amazônia Oriental, Belém, Brazil
4Instituto Nacional de Pesquisas da Amazônia (INPA), Coordenação de Dinâmica Ambiental (CDAM), Manaus, Brazil
5Max Planck Institute for Biogeochemistry (MPI-BGC), Hans-Knoell-Straße 10, 07745 Jena, Germany
6Netherlands Organisation for Applied Scientific Research (TNO), Environmental Modelling Sensing and Analysis (EMSA), Netherlands

Methane (CH4) is the second most important long-lived anthropogenic atmospheric greenhouse gas. Despite its importance, natural sources of methane, such as tropical wetlands, are still not well understood and a large source of uncertainty to the global CH4 budget. The Amazonian rain forest is estimated to hold 90-120 Pg of carbon, which is approximately 14-27% of the carbon stored in vegetation worldwide. The region is characterized by high precipitation rates and large wetlands, and it has been estimated that the Amazon basin emits 7% of the annual total CH4 emissions. Due to its remote location, micro-meteorological measurements are rare and absent for other gases than CO2.

The 50 m high K34 tower (field site ZF2) is located in a pristine tropical forest region 60 km northwest of Manaus (Brazil), and is located next to a waterlogged valley, a possible location for anaerobic CH4 production. In October 2018, in addition to the existing EC CO2 system, a Relaxed Eddy Accumulation (REA) system was set up at this tower, connected to an in-situ FTIR-analyzer. This set up continually measures fluxes and concentration profiles of CO2, CO, CH4, N2O and δ13CO2. In addition, CH4, CO2, and N2O uptake and emission processes were studied by flux chamber measurements in the footprint of the REA tower, focusing on different possible sources (soil, stream, trees and termites). In this presentation, an overview of the measured CH4 and N2O forest concentrations and fluxes will be shown.