

6.114 Transport and transformation of trace species in a deep convective cloud - results of the ACRIDICON tracer experiment.

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Abstract:

We report on a perfluorocarbon tracer experiment performed during the HALO (German GV research aircraft) campaign ACRIDICON in Manaus, Amazonas, Brazil, on 25 Sept. 2014 to study air mass transport and transformation of trace species in a deep tropical convective cloud. The tracer experiment included three steps: tagging of the pollution plume of the city of Manaus with the artificial gas tracer PMCH (C_7F_{14}), sampling of the tracer in the boundary layer downstream of the release site, and detection of the tracer in the outflow of a convective cloud at 12 km altitude which developed in the area of the dispersing Manaus pollution plume tagged with the tracer. The PMCH tracer was released from the top of a hotel west of the city center of Manaus, and sampled on board of HALO using adsorption tubes. The analysis of the PMCH tracer sampled with the tubes was conducted in the laboratory using a combination of a thermo-desorption system and a GC-MS with a detection limit of 1 ppq (10^{-15}). The PMCH tracer could be clearly detected in the convective inflow and outflow with mixing ratios up to a factor of seven above atmospheric background values. The PMCH measurements are compared with observations of ambient tracer and used to infer loss and production of reactive nitrogen species and non-volatile and volatile aerosols during the convective transport.