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Peroxy radical observations over West Africa during AMMA 2006: photochemical activity in the outflow of convective systems

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Abstract. Peroxy radical measurements made on board the DLR-Falcon research aircraft over West Africa within the African Monsoon Multidisciplinary Analysis (AMMA) campaign during the 2006 wet monsoon are presented in this study. The analysis of data focuses on the photochemical activity of air masses sampled during episodes of intense convection and biomass burning. Generally, the total sum of peroxy radical mixing ratios, measured in the outflow of convective clouds, are quite variable but occasionally are coupled with the NO variations indicating the coexistence or simultaneous emission of NO_x, with a potential radical precursor (i.e. formaldehyde, acetone or peroxides), which has likely been transported to higher atmospheric altitudes. Based on the measurements, significant O₃ production rates around 1 ppb/h in the MCS outflow are estimated by using a box model with simplified chemistry. Peroxy radicals having mixing ratios around 20–25 pptv and with peak values of up to 60–70 pptv are measured within biomass burning plumes, detected at the coast in Ghana. Calculations of back-trajectory densities confirm the origin of these air masses being a biomass burning region at southern latitudes and close to the Gulf of Guinea, according to satellite pictures.

Measured peroxy radical concentrations agree reasonably with modelled estimations taking into account simple local chemistry. Moreover, the vertical profiles taken at the aircraft base in Ouagadougou, Burkina Faso, indicate the common feature of having maximum concentrations between 2 and 4 km, in agreement with other literature values obtained under similar conditions.

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