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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric nitrogen budget in Sahelian dry savannas" *by* C. Delon et al.

Anonymous Referee #1

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The reviewer has carefully read the reply from the authors. However, the main drawbacks of the study still remain. It is not justifiable to calculate dry deposition fluxes in the absence of (micro)-meteorological measurements (wind speed, wind direction, temperature etc.) at the measurement sites and to upscale these for a whole region. It is unclear to the reviewer with which values the authors have fed the ISBA-SURFEX model in order to calculate the resistance values according to the Wesely and Hicks (1977) approach (apparently this was done with values taken from ALMIP satellite data). Most parameterizations for surface resistances require at least the surface temperature, radiation or turbulent fluxes of sensible and latent heat, which were all not measured in this study. The authors have to make so many assumptions in order to run the ISBA-SURFEX model input (temperature, friction velocity etc.) and the errors of the deposition fluxes are probably so large (and not even quantifiable) that the quality

of the manuscript does not meet the requirements of ACP.

The authors have apparently not understood the implications of the “constant flux layer assumption”. The authors cannot prove that chemical transformations are slower than turbulent transport based on the fact that they have measured at 1.5m above ground. This measurement height is quite close to ground level, where e.g., NO emitted by soils is rapidly oxidized by O_3 and converted to NO_2, thereby disturbing the photo-stationary state condition. NO_2 is then chemically produced and the concentration profiles in the surface layer may thus be modified by chemical reactions. In order to proof that this was not the case, respective measurements of diel variations (under different atmospheric stability conditions) of concentrations and (at least) wind speed are required. Instead, the authors consider the reaction of NO_2 with OH radicals, which typically takes place within timescales of hours (much slower than turbulent transport) and is typically not considered for the investigation of chemical divergences.

Despite the fact that the study was done in a rarely explored region of Africa, the reviewer cannot support publication in ACP.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 14189, 2009.