



Tropical inorganic nitrogen: measurements and estimates of wet and dry deposition rates to an Amazonian pasture

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Dry and wet deposition rates of reactive nitrogen (N) species have been extensively measured in temperate regions. Only few data sets exist about wet N deposition in tropical ecosystems and quantitative experimental information about dry N deposition in tropical environments has been lacking. We estimated wet and dry N deposition rates at a pasture site in the Amazon Basin (Rondônia, Brazil, LBA-SMOCC) based on in-situ measurements covering the late dry season (biomass burning), a transition period, and the onset of the wet season (clean conditions). Ammonia (NH₃), nitric acid (HNO₃), nitrous acid (HONO), nitrogen dioxide (NO₂), nitric oxide (NO), ozone (O₃), aerosol ammonium (NH₄⁺) and aerosol nitrate (NO₃⁻) were measured in real-time, accompanied by simultaneous (micro-)meteorological measurements. Dry

deposition fluxes of NO_2 and HNO_3 were inferred using the “big leaf multiple resistance approach”. In the case of NH_3 and HONO, we predict bi-directional surface-atmosphere exchange fluxes with the aid of a canopy compensation point model. Dry deposition fluxes of aerosol particles were derived using established empirical parameterizations. Wet N deposition was determined by collection and subsequent analyses of rainwater samples. We estimated a total (dry + wet) N deposition of $7.3 - 9.8 \text{ kgN ha}^{-1} \text{ yr}^{-1}$ to the tropical pasture site, whereof $2 - 4.5 \text{ kgN ha}^{-1} \text{ yr}^{-1}$ are attributed to dry N deposition and $\sim 5.3 \text{ kgN ha}^{-1} \text{ yr}^{-1}$ to wet N deposition. It is expected that $2 - 6.5 \text{ kgN ha}^{-1} \text{ yr}^{-1}$ are (re-)emitted from the pasture site, mainly in form of gaseous NH_3 , but also HONO and NO. Our estimate exceeds total (wet + dry) N deposition to tropical ecosystems predicted by global chemistry and transport models by at least factor of two.