



## **Observations and methodology of atmospheric ammonia within the Colorado Rocky Mountain pine forest**

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Concentrations of trace gases (HCl, HNO<sub>3</sub>, HONO, NH<sub>3</sub>, SO<sub>2</sub>) and particle phase constituents from fine particulate matter (PM<sub>2.5</sub>) were continuously measured using an online ambient ion monitor ion chromatograph (AIM-IC) within the canopy at the Rocky Mountain Research Station (Manitou Experimental Forest) in Woodland Park, Colorado, from July 31 – August 12 2015. A consistent diurnal pattern of ammonia mixing ratios was observed, ranging from 0.1 – 2.6 ppb. Analysis of PM<sub>2.5</sub> ammonium was below the 130 ng m<sup>-3</sup> detection limit of the instrument, which was corroborated by parallel particle concentration data also gathered at the site showing extremely low overall particle concentrations in the order of 10<sup>3</sup>. As a result, variability in gas phase ammonia can be attributed to surface-atmosphere exchange and/or transport rather than gas particle partitioning. Complimentary analysis of ammonium found within the pine needles and the soil was also performed on site using established extraction methods and analysis by ion chromatography. Emissions potentials calculated from observed ammonium levels were generally consistent in the pine needles showing stomatal emission potentials within the range of 28 – 60, whereas the soil data varied widely, spanning 5 – 2100. The measurements are used to quantify compensation points of ammonia representative of the canopy and ground at the site to better predict the biosphere-atmosphere exchange of ammonia within the forest.