Deriving a speciated atmospheric nitrogen budget at Auchencorth Moss, a background site in South East Scotland

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Since 2006, the EMEP supersite, Auchencorth Moss, has routinely measured HNO$_3$, HONO, NO, NO$_2$, NH$_3$ and speciated aerosols including NH$_4^+$ and NO$_3^-$ in PM$_{2.5}$ and PM$_{10}$. It is known that other reactive N species are important in the atmosphere at background sites including PANs, peroxy nitrates, alkyl nitrates, CINO$_2$ and N$_2$O$_5$ and routine measurements are not frequently assessed against these other species. The following study presents the highlights from an intensive study, in spring 2014, where non-routine measurements (TD-LIF and PAN GC) were carried out alongside routine measurements (MARGA, ANNO$_x$, NO$_x$ ThermoFisher Analyser). The objectives of the study were to understand further the role of non-routine measured species in the N budget at this site and to try to identify potential artefacts in current routine measurements.

Initial comparison studies suggest that routine measurements capture well the temporal variations in NO$_x$ and HNO$_3$, though questions remain on the accuracy of the measurements. During the study on average low concentrations of all species (NO$_2$ = 1.58 ppb, NH$_3$ = 2.3 ppb, HNO$_3$ = 0.09 ppb, HONO= 0.07 ppb) were observed, though there were periods where polluted air masses arrived at the site resulting in an increase in both routine and non-routine measured species. As well as air masses transporting N species, there was evidence of atmospheric chemical transformations of N species at the site, including the photochemical production of PAN.