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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, $ClNO_2$ and N_2O_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.