

## **First measurements of NO<sub>3</sub> reactivity in air – surprises from the boreal forest.**

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We describe the first instrument for measurement of the total reactivity ( $s^{-1}$ ) of NO<sub>3</sub> in ambient air. The instrument can measure reactivities between  $0.005 s^{-1}$  and  $45 s^{-1}$  with an accuracy of  $\sim 16\%$  (Liebmann et al., 2016). Results from the deployment of the instrument during the IBAIRN campaign (Influence of Biosphere-Atmosphere Interactions on the Reactive Nitrogen budget, September 2016) in a boreal environment in Hyytiälä, Finland are presented. The NO<sub>3</sub> reactivity (in canopy at a height of 8.5 m) showed a strong diel profile with a night-time mean and maximum values of  $0.11$  and  $0.94 s^{-1}$ , respectively. The corresponding day-time values (excluding the contribution of NO) are  $0.04$  and  $0.5 s^{-1}$ . The NO<sub>3</sub> reactivity at night displayed a strong vertical gradient between 8 m (in canopy) to 25 m (above canopy) with maximum values close to the ground. On average, BVOCs accounted for only  $\sim 10\%$  of the observed nighttime NO<sub>3</sub> reactivity, though on some occasions this was even less than 1%. The highest night-time reactivities coincided with major depletion of canopy level ozone. Possible explanations for these findings and their implications for reactive nitrogen in the boreal forest are discussed.