FOREST FLUX

NITROSPHERE

THÜNEN

Validation of nitrogen dry deposition modelling above a mixed forest using high-frequency flux measurements

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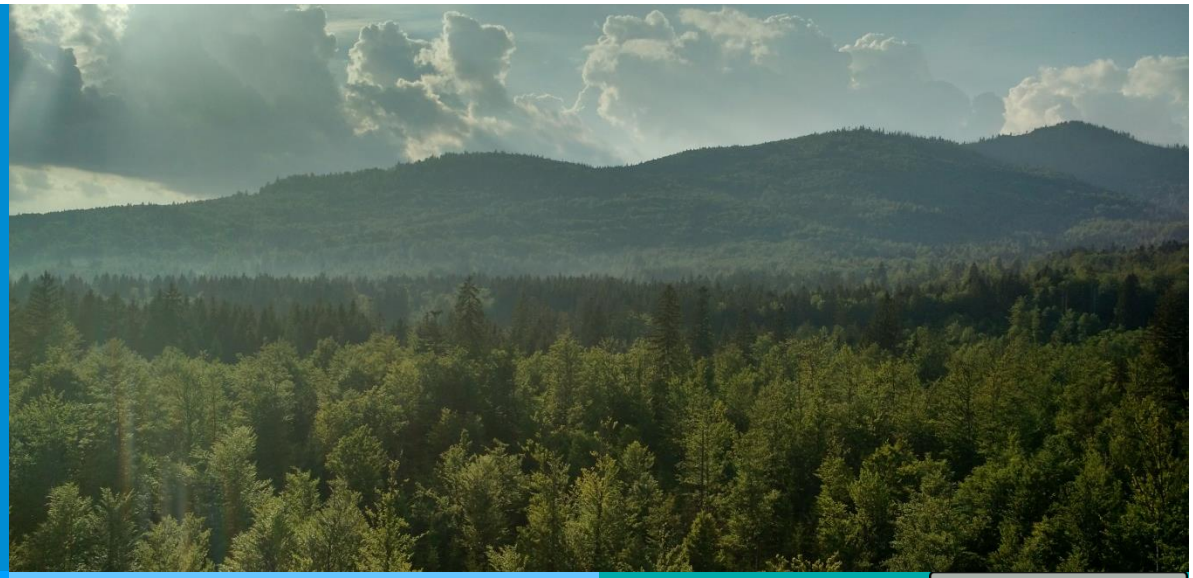

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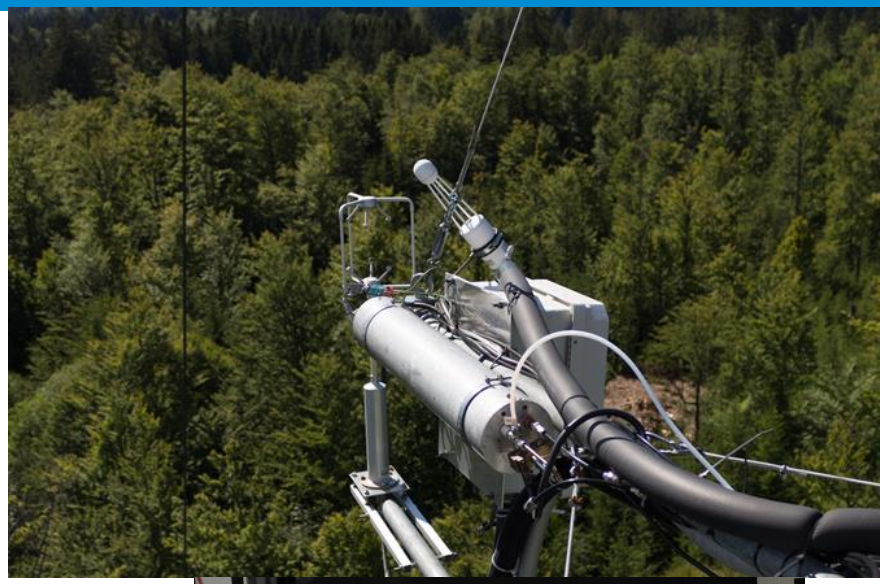
Motivation

‘Too much of a good thing’

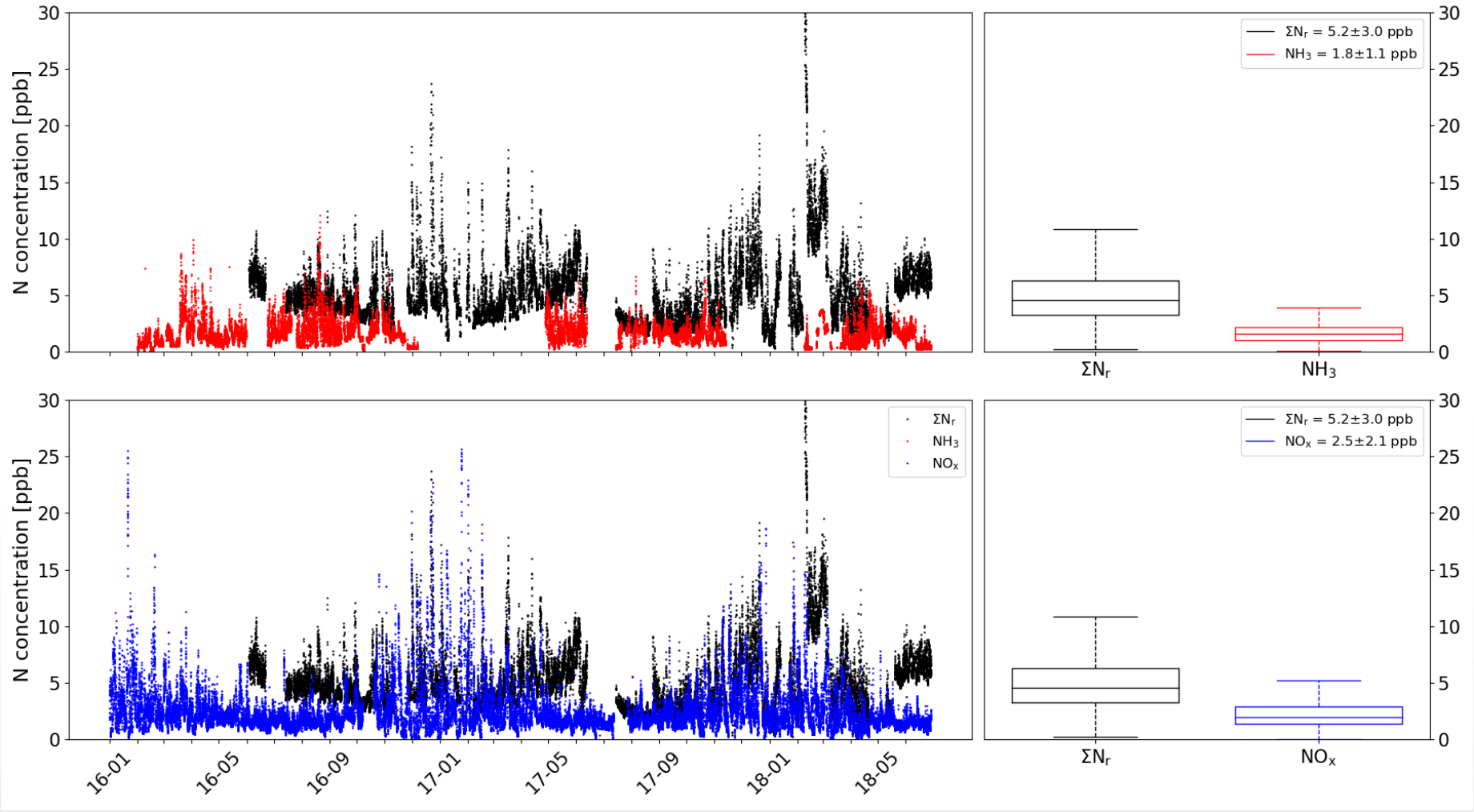
- Reactive forms are an essential nutrient for plants; however, intensive supply of nitrogen by fertilization or atmospheric deposition is harmful for some ecosystems and human health (smog).
- Measuring reactive nitrogen compounds is quite challenging → problems due to typically low concentrations of N_r, high reactivity, water solubility.
- $\Sigma N_r = NO_2+NO+NH_3+HNO_3+HONO+NH_4NO_3$

Method and Objectives

- Flux measurements of ΣN_r above a remote, mixed forest
- Eddy-covariance setup consisting of the **TRANC** (Converter for ΣN_r), which was coupled to a chemical luminescence detector (**CLD 780 TR**), **Gill R3** (Sonic) (wind components and temperature)
- Flux calculation was performed with EddyPro. Flux post-processing led to gaps. Gaps were filled up with deposition module DEPAC with locally measured input variables and mean diurnal variation principle
- Comparison to transport model LOTOS-EUROS for different land use classes and canopy budgets technique



Concentration of ΣN_r, NH_3 and NO_X



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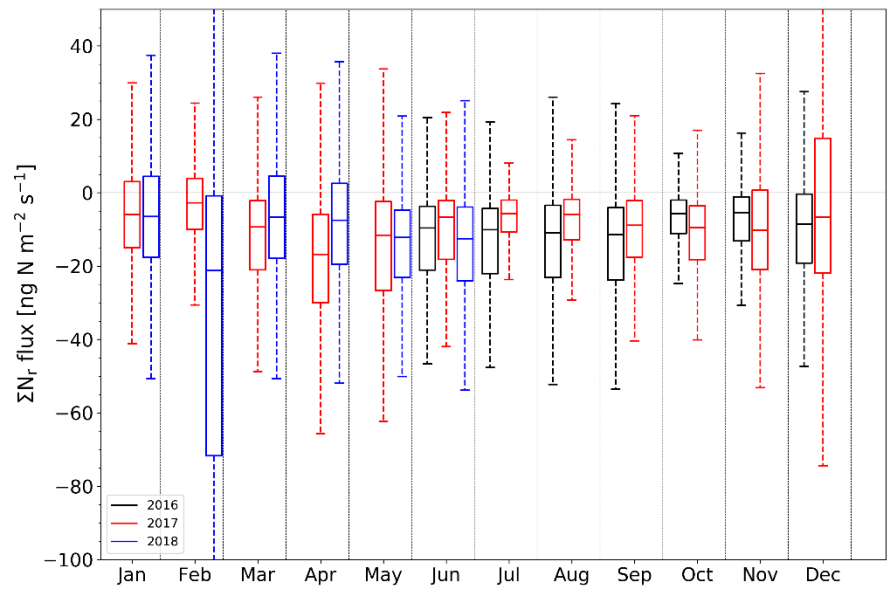
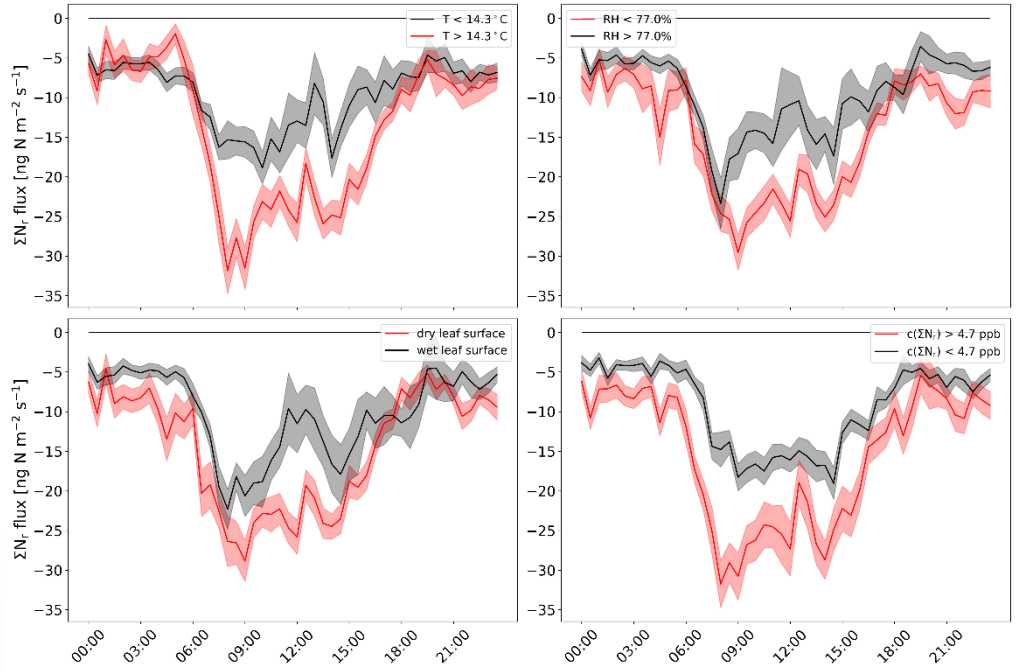
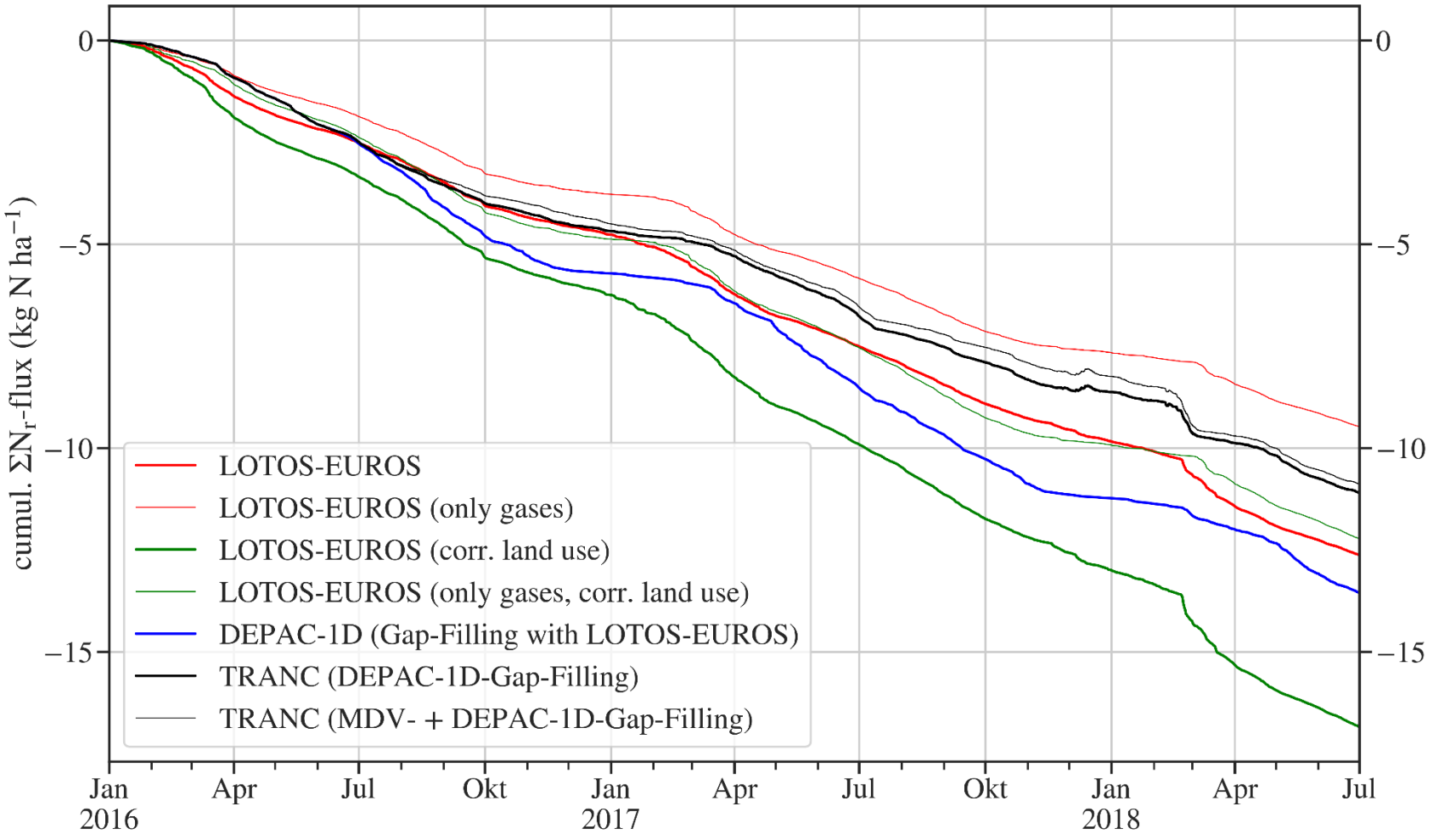
Fluxes of ΣN_r



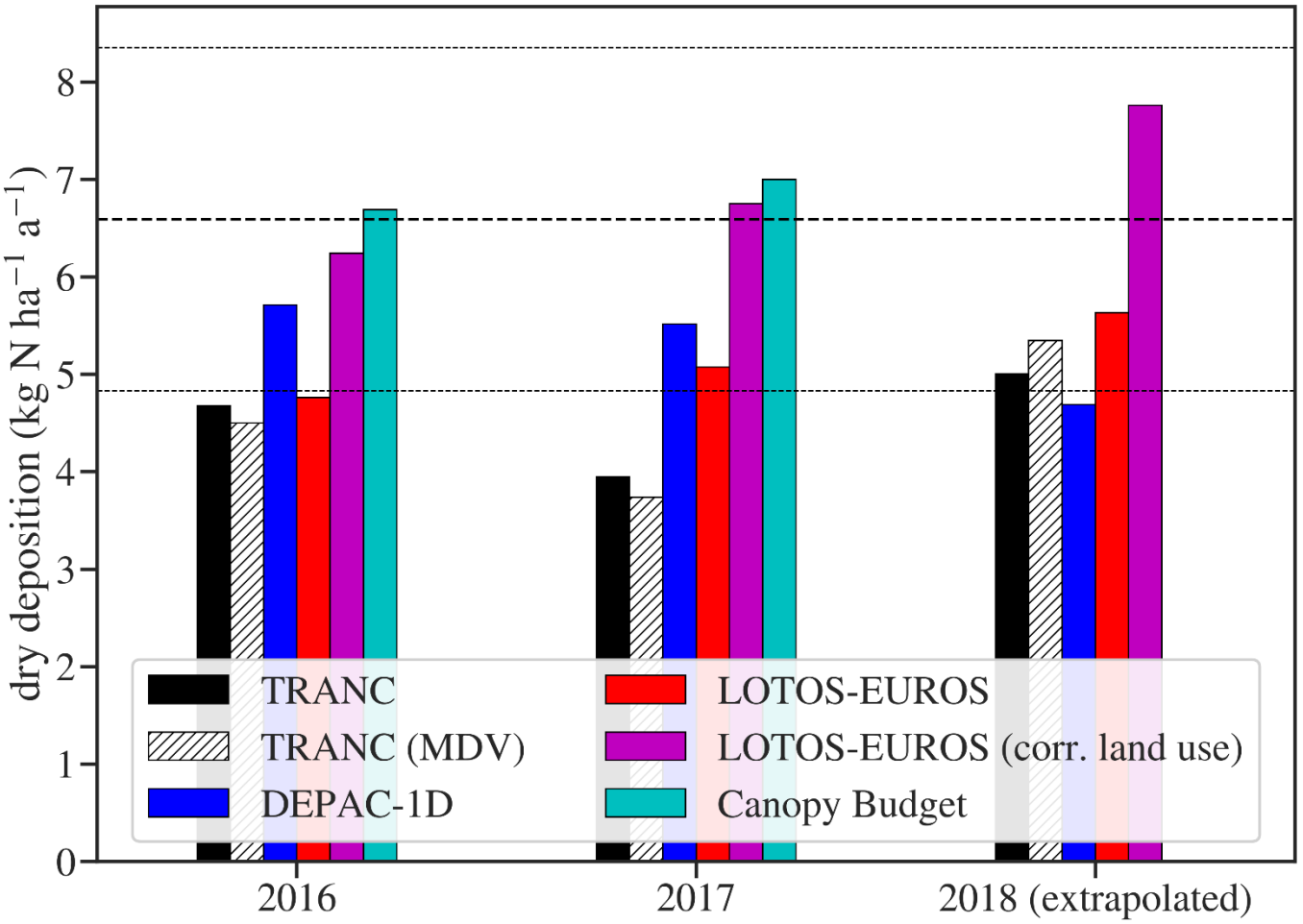


- Mainly deposition occurred at the site. High deposition and emission during Feburary 2018
- Deposition enhanced during summer, low deposition or neutral during winter
- Dry conditions seem to favor dry deposition, which is in contradiction to findings for NH_3

Nitrogen dry deposition at Forellenbach without gaps



Annual dry deposition



Conclusion

- First demonstration of long-term measurements at a remote site
- Low concentration of ΣN_r ; about 5.2 ppb
- Mostly deposition during measurement period, enhanced exchange from May until September
- Dry conditions favor deposition
- Annual mean dry deposition of all methods was close to each other (4.5 - 6.9 kg N $ha^{-1}yr^{-1}$)
- Wet deposition was 6.9 kg N ha^{-1} a^{-1} (2016) and 8.1 kg N ha^{-1} a^{-1} (2017)
- Σ = (11.6-13.2) kg N ha^{-1} a^{-1}; (12.1 - 14.9) kg N ha^{-1} a^{-1}

Thank you for watching!

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