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Supplement of

Surface–atmosphere exchange of ammonia over peatland using QCL-based eddy-covariance measurements and inferential modeling

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Supplementary material

Parameters of the Weseley model

We used the original formulation of the Wesely (1989) model with a minimum R_s for H_2O of 200 s m^{-1}, scaled by the ratio of the molecular diffusivities of H_2O and NH_3:

$$R_s = 200 \cdot \frac{D_{H_2O}}{D_{NH_3}} \cdot \left(1 + \left(\frac{200}{S_t + 0.1}\right)^2\right) \frac{400}{T \cdot (T - 40)}$$

where S_t is global radiation in W m^{-2}, D_x is the molecular diffusivity of H_2O and NH_3 in air, respectively, in m^2 s^{-1}, and T is the surface temperature in °C. Note that we were not able to optimize these parameters due to a lack of data in the dry range, where cuticular deposition is restricted. A +/- 100 % change in the minimum stomatal resistance leads to a change in total cumulative ammonia flux between -7 % and +19 % (for 300 s m^{-1} and 100 s m^{-1}, respectively).

Table S1: Data classification and results of Kruskal-Wallis test on the deposition velocity, the canopy compensation point, the emission potential and canopy resitance; the null hypothesis of identical population is rejected, when the p-value is below the significance level of $\alpha = 0.05$, the Post-hoc-test confirms if the distributions in all groups are significantly different, if not, the equal groups are listed (see Section 3.2 for further details).

Deposition velocity	**Groups**			**p-value**	**Post-Hoc**
	1	**2**	**3**		
Air temperature	<5°C	5 – 10°C	>10°C	<0.001	All differ
Precipitation	0 mm	>0 mm		0.811	All equal
Days after last rain	1 – 2 d	2 – 5 d	>5 d	0.115	All equal
Net radiation	<0 W m^{-2}	0 – 150 W m^{-2}	>150 W m^{-2}	<0.001	All differ
Canopy resitance	**Groups**			**p-value**	**Post-Hoc**
	1	**2**	**3**		
Air temperature	<5°C	5 – 10°C	>10°C	0.149	All equal
Precipitation	0 mm	>0 mm		0.005	All differ
Days after last rain	1 – 2 d	2 – 5 d	>5 d	<0.001	1=2

Net radiation	<0 W m^{-2}	0 – 150 W m^{-2}	>150 W m^{-2}	<0.001	All differ
Canopy compensation point	**Groups**			**p-value**	**Post-Hoc**
	1	**2**	**3**		
Air temperature	<5°C	5 – 10°C	>10°C	<0.001	All differ
Precipitation	0 mm	>0 mm		<0.001	All differ
Days after last rain	1 – 2 d	2 – 5 d	>5 d	<0.001	All differ
Net radiation	<0 W m^{-2}	0 – 150 W m^{-2}	>150 W m^{-2}	<0.001	All differ
Emission potential	**Groups**			**p-value**	**Post-Hoc**
	1	**2**	**3**		
Air temperature	<5°C	5 – 10°C	>10°C	<0.001	All differ
Precipitation	0 mm	>0 mm		<0.001	All differ
Days after last rain	1 – 2 d	2 – 5 d	>5 d	<0.001	1=2
Net radiation	<0 W m^{-2}	0 – 150 W m^{-2}	>150 W m^{-2}	<0.001	All differ

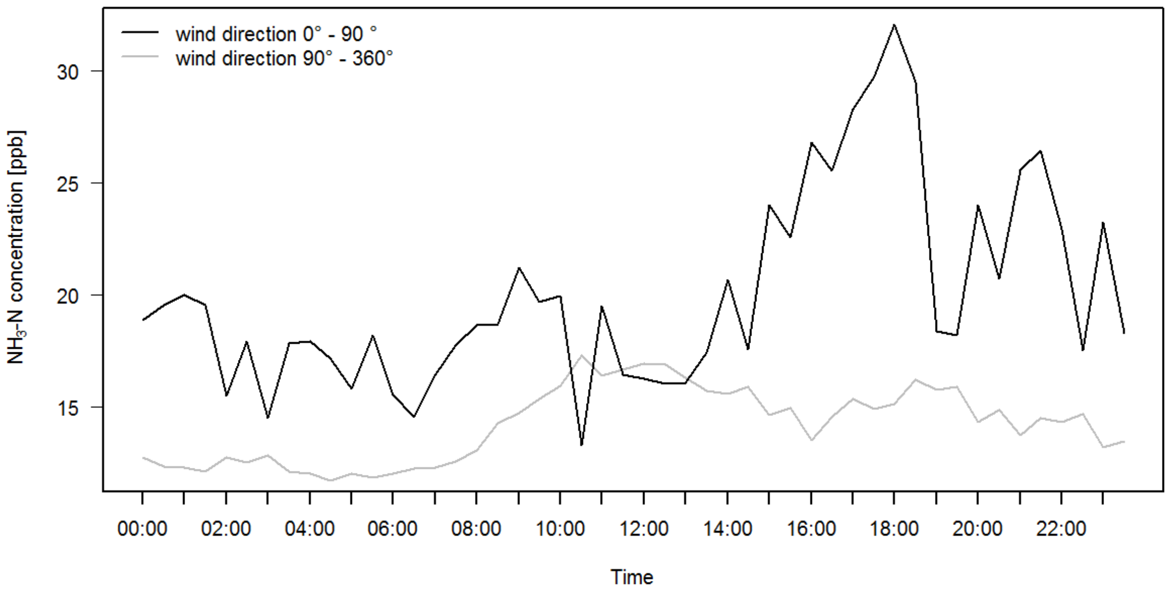

Fig. S1: Mean diurnal variation of ammonia concentrations separated by wind direction.

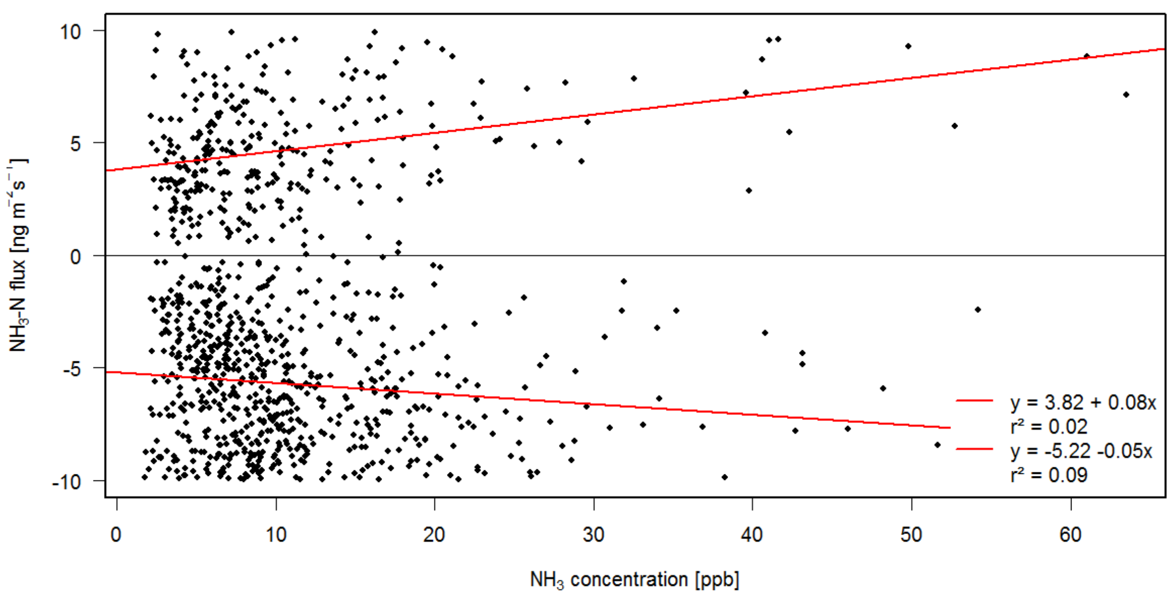

Fig. S2: Half-hourly scatter plot showing the dependency of NH_3 fluxes (only in a range of -10 to 10 ng N m-2s-1) on NH_3 concentration, red line: linear regression above for emission, below for deposition, for coefficients and r^2 see legend

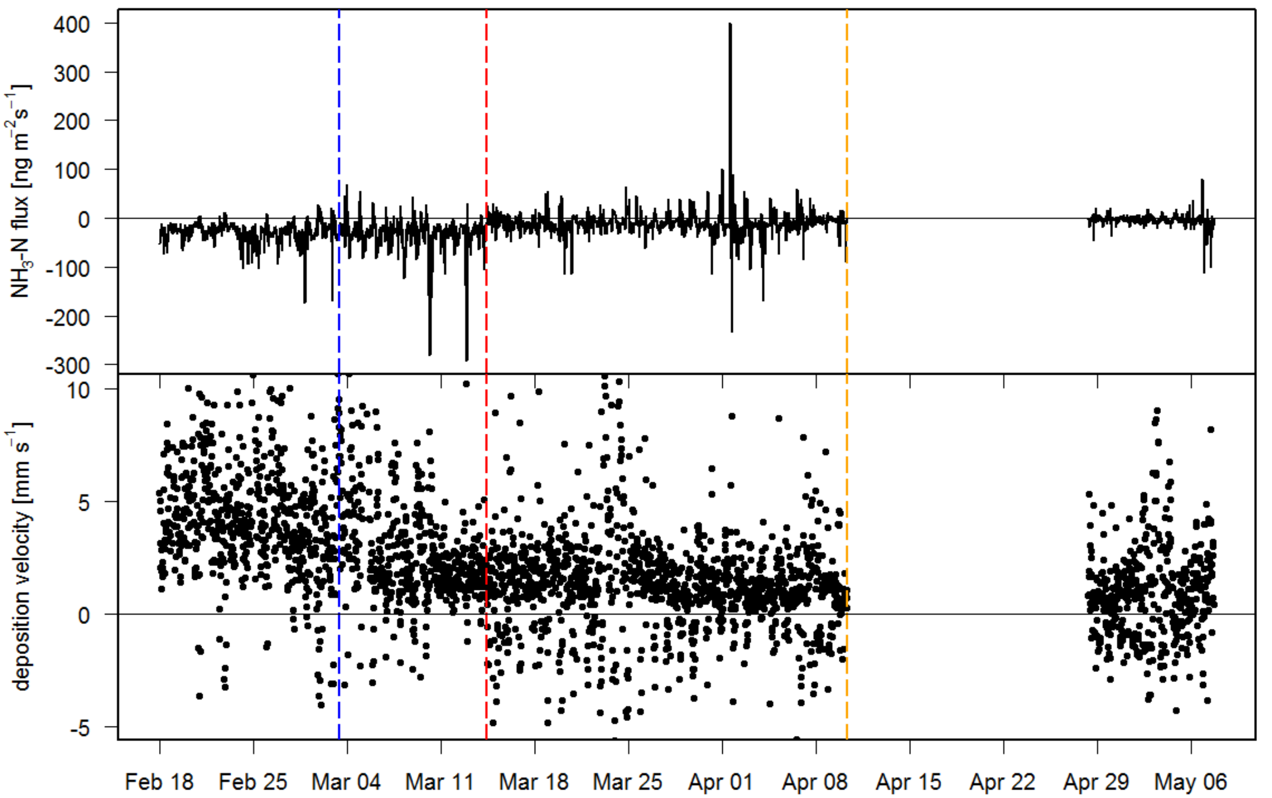

Fig. S3: Half-hourly ammonia fluxes (upper panel) and half-hourly ammonia deposition velocities (lower panel) during the whole campaign.

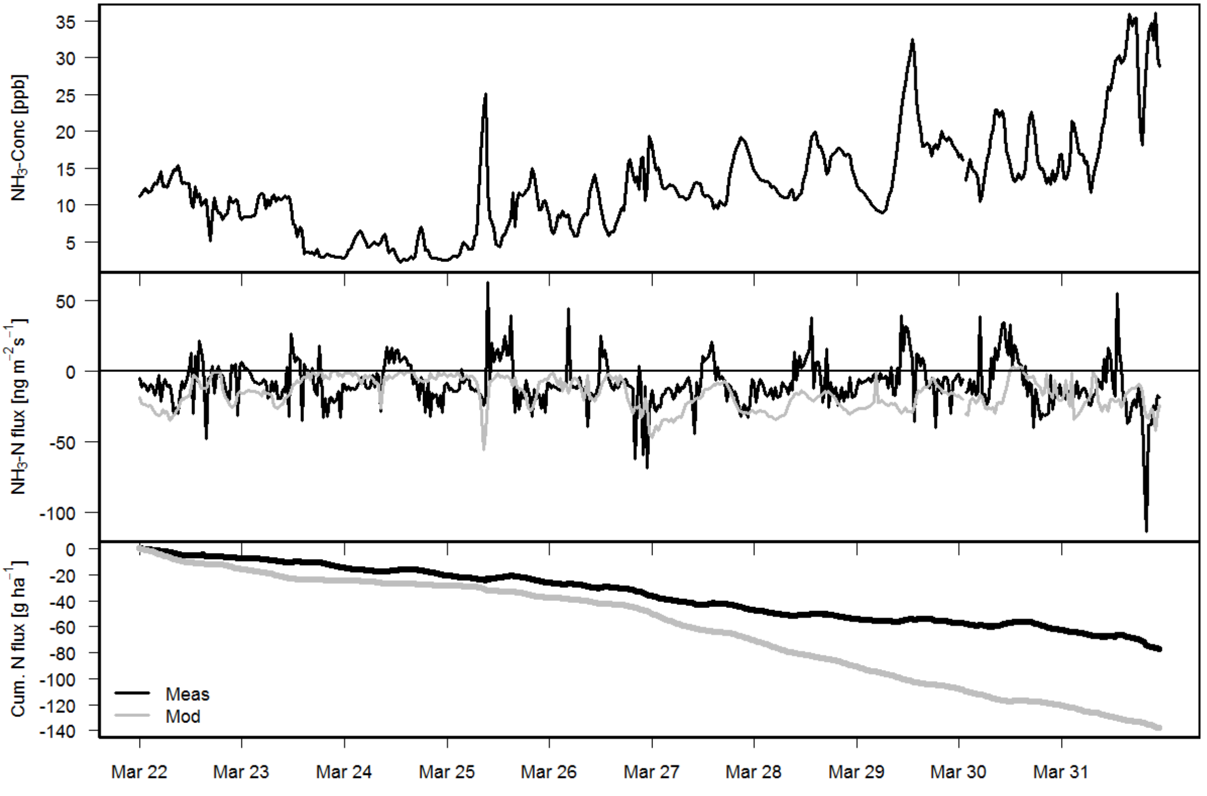

Fig. S4: Measured ammonia concentrations (upper panel), comparison of measured and modeled half-hourly ammonia fluxes (middle panel) and cumulative ammonia flux (lower panel) based on half-hourly data during one week of the measurement campaign.