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Net summertime emission of ammonia from corn and triticale fields

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Recent advancements in laser spectrometry offer new opportunities to investigate ecosystem-atmosphere exchange of environmentally relevant trace gases. In this study, we used a quantum cascade laser (QCL) absorption spectrometer to continuously measure high-frequency concentrations of ammonia and the net exchange between an agricultural site and the atmosphere based on the eddy-covariance approach. The footprint was split into two main sectors, one planted with corn (Zea mays) and the other one with triticale. Ammonia concentrations were highly variable between 2 and almost 100 ppb with an average value of 8.1 ppb during the observation period from April to September 2015. While both deposition and emission of ammonia was observed, the total campaign exchange resulted in a loss of 3.3 kg NH_3-N ha^{-1}. Highest average emission fluxes of 65 ng N m^{-2} s^{-1} were recorded after fertilization at the beginning of the campaign in April and May. Afterwards the exchange of ammonia with the atmosphere decreased considerably, but the site remained on average a consistent source with sporadic lower peaks and an average flux of 13 ng N m^{-2} s^{-1}. While management in the form of fertilization was the main driver for ammonia concentration and exchange at the site, biophysical controls from temperature, wind regime, and surface wetness are also presented.