



Surface-atmosphere exchange of ammonia over a corn field: eddy covariance flux measurements using QC-TILDAS

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Atmospheric ammonia (NH_3) is an important precursor to fine particulate matter in the atmosphere, adversely affecting air quality, climate and biodiversity. Agricultural activities are the predominant source of NH_3 , including the volatilization of N fertilizers such as urea. At the same time, it is known the ammonia can undergo bi-directional exchange with terrestrial ecosystems. Therefore, it is important to quantify the variability of ammonia exchange between crops and the atmosphere across the growing season to better understand the fate of N applied as fertilizer. The study presents direct eddy covariance (EC) NH_3 flux measurements from a urea-fertilized corn field in Ottawa, Canada, over two growing seasons in the years of 2017 and 2018. A flux tower was equipped with a 3-D sonic anemometer (CSAT3; Campbell Scientific, UT), and a fast time-response Quantum Cascade Tunable Infrared Differential Absorption Spectrometer (QC-TILDAS; Aerodyne Research, MA) for NH_3 measurements at 10 Hz. During the 2017 season, NH_3 emissions reached up to 500 ng m^2/s within one week after fertilizer application. As the canopy started growing, the NH_3 emissions decreased and by the end of the growing season deposition dominated. In 2018, there was little evidence of NH_3 emission immediately following fertilizer application, but sustained emissions occurred following a rainfall event two weeks later. The roles of soil chemistry, atmospheric composition, turbulence, and climate variables in regulating the ammonia fluxes will be presented.