Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2019-193-RC1, 2019

Atmospheric Measurement Techniques Discussions

Interactive comment on "Measurements and quality control of ammonia eddy covariance fluxes: A new strategy for high frequency attenuation correction" *by* Alexander Moravek et al.

Anonymous Referee #2

Received and published: 16 July 2019

Moravek et al used a quantum cascade laser spectrometer to determine ammonia concentrations at 10 Hz, which is still lacking in the field measurements. Together with 3D wind vector, they calculated ammonia exchange flux with different correction scenarios. They also proposed a new method to correct ammonia flux, with the median flux loss of 34 % which is substantially higher than the ogive method. The new method may shed light on flux correction of other reactive species with strong adsorption like nitric and organic acids. Combined, these make for a very strong paper –one of the best I have reviewed in some time.

I recommend the authors attend to a few comments in revising the manuscript:

Page 2, Line 5: In addition to Europe, the Great Salt Lake Region also experienced an ammonium salts rich condition, as suggested by another paper of the authors (Moravek et al., 2019). This is also the case in North China (Li et al., 2019). It is better to mention this worldwide situation here.

Page 2, Lines 7-10: The major sources of ammonia are from agriculture globally and regionally. On an urban scale, however, the sources may be non-agricultural emissions (Pan et al., 2016). So the mitigation strategy for improving air quality may be not work if only controlling agricultural sources. Although I agree with the authors that measuring the flux is critical to reduce uncertainty of the ammonia inventory, identifying the major sources is also important.

Page 2, Lines 14-15: Classic references may be required here for the readers' convenience, rather than shown them together at lines 18-19.

Page 2, Line 16: change ammonia to NH3.

Page 4, Line 2: change particulate matter to PM, as defined at Page 2 Line 5.

Page 4, Line 7: Just a comment, 5.5 m may be too long for ammonia determination.

Page 4, Line 7: Heated to 40 oC?

Page 6: Did the authors perform calibration of ammonia with known concentrations?

Page 7, Line 26: change ammonia to NH3, check through the text.

Page 11, Results: I suggest the authors detail diurnal variations of ammonia flux.

Finally, this reviewer is wondering if an early morning pulse of ammonia flux/ concentration was observed during this campaign. And is it possible using ammonia flux determination in this study to support the ideas proposed by Wentworth et al. (2016), who are also from Jennifer's group, that dew is a night-time reservoir and morning

source for atmospheric ammonia?

References

Li, H., Cheng, J., Zhang, Q., Zheng, B., Zhang, Y., Zheng, G., and He, K.: Rapid transition in winter aerosol composition in Beijing from 2014 to 2017: response to clean air actions, Atmos. Chem. Phys. Discuss., 2019, 1-26, 10.5194/acp-2019-450, 2019.

Moravek, A., Murphy, J. G., Hrdina, A., Lin, J. C., Pennell, C., Franchin, A., Middlebrook, A. M., Fibiger, D. L., Womack, C. C., McDuffie, E. E., Martin, R., Moore, K., Baasandorj, M., and Brown, S. S.: Wintertime Spatial Distribution of Ammonia and its Emission Sources in the Great Salt Lake Region, Atmos. Chem. Phys. Discuss., 2019, 1-28, 10.5194/acp-2019-266, 2019.

Pan, Y., Tian, S., Liu, D., Fang, Y., Zhu, X., Zhang, Q., Zheng, B., Michalski, G., and Wang, Y.: Fossil fuel combustion-related emissions dominate atmospheric ammonia sources during severe haze episodes: Evidence from 15N-stable isotope in size-resolved aerosol ammonium, Environ Sci Technol, 50, 8049-8056, 10.1021/acs.est.6b00634, 2016.

Wentworth, G. R., Murphy, J. G., Benedict, K. B., Bangs, E. J., and Collett Jr, J. L.: The role of dew as a night-time reservoir and morning source for atmospheric ammonia, Atmos. Chem. Phys., 16, 7435-7449, 10.5194/acp-16-7435-2016, 2016.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-193, 2019.