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A compact DOAS instrument optimised for ammonia field-measurements

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Accurate, high time-resolution measurements of NH3 in ambient air are still a challenge due to the stickiness of this molecule and its interactions with inlet or instrument surfaces. Differential optical absorption spectroscopy (DOAS) with open-path arrangement offers a contact-free in-situ approach to determine ambient NH3.
We present a DOAS instrument, optimised for open-path field-measurements of ambient ammonia (NH3) alongside nitrogen oxide (NO) and sulphur dioxide (SO_2). This device, operating in the UV range over paths of up to 100 m, is a further development of the miniDOAS presented by Volten et al. (2012). We use a temperature-controlled spectrometer, a deuterium light source and a modified optical arrangement. The system was set up in a robust, field-deployable, temperature-regulated housing. For the evaluation of light spectra a new high-pass filter routine based upon robust baseline extraction with local regression was used. In order to fit differential absorption cross-sections to the measurements, multiple linear regression is performed including terms of an autoregressive-moving-average model. In this presentation we discuss the influence of filter and fit procedure on the precision and accuracy of the system with examples of field measurements with artificial NH3 sources.

Volten, H., Bergwerff, J. B., Haaima, M., Lolkema, D. E., Berkhout, A. J. C., van der Hoff, G. R., Potma, C. J. M., Wichink Kruit, R. J., van Pul, W. A. J. and Swart, D. P. J.: Two instruments based on differential optical absorption spectroscopy (DOAS) to measure accurate ammonia concentrations in the atmosphere, Atmospheric Meas. Tech., 5(2), 413–427, doi:10.5194/amt-5-413-2012, 2012.