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Atmospheric Measurement Techniques Discussions

Interactive comment on "TRANC – a novel fast-response converter to measure total reactive atmospheric nitrogen" *by* O. Marx et al.

Anonymous Referee #1

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Comments on TRANC – A novel fast-response converter to measure total reactive atmospheric nitrogen

by O. Marx, C. Brümmer, C. Ammann, V. Wolff, and A. Freibauer

This manuscript describes a new technical variant of extending the classical NO - ozone chemiluminescence analyzer with a converter. This converter would make more atmospheric nitrogen compounds accessible for quantification.

The content of the manuscript would fit well within the scope of Atmospheric Measurement Techniques.

In general the text prepared is rather well prepared. However, the authors may give the

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following remarks some considerations.

The development of techniques to augment tools for characterizing atmospheric compounds has a value in itself. A few thing are not touched, however. They include potential interferences due to the high temperature converter. Even if in clean air conditions such compounds may contribute minor amounts, their behavior within the converter should be characterized: HCN, CH3CN, and N2O.

What also needs more attention is the air inlet of the converter system. This part will be critical for aerosol which purposely is to be cracked. Is there an influence of (changing) humidity on the conversion ? Especially the nitrate containing aerosols would show a delicate behavior.

p2/l30

It seems that the authors use the designation Nr for reactive nitrogen containing compounds but also for the sum of them.

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Brümmer et al., 2011 2011 a and/or b ? appears more than once

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Besides the necessity ...: rephrase this sentence

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the interactions ...: it may be useful to more spell out these interactions, especially in respect to the sampling of the air to be measured.

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It is interesting to note that the sum of the individually measured nitrogen containing compounds in the comparison shown in Figure 7 match better the TRANC-result than one would expect according to Figure 6. What would an error propagation analysis tell

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when measuring the assumed individual compounds and adding them up for comparing to the sum.

Table 1:

Why not adding TRANC-Chemiluminescence to the list ?

Figure 4:

It is difficult to infer stability of the calibration over time from this figure.

Figure 5:

It were helpful to mention the calibration gas mixing ratios (not concentrations) in the caption. Otherwise the conversion efficiencies are not recognized.

Figure 6:

Is there an explanation why ammonium nitrate measurement points are above the 1:1 line and ammonium sulfate below ? The explanation for the deviation given in the text is rather weak. The authors should keep in mind, that the usefulness of their converter were given only if the conversion rates of all compounds they subsume under Nr were 100 %.

Reference to the publications

Sigsby, J. E., Jr., F. M. Black, T. A. Bellar, and D. L. Klosterman, Chemiluminescent Method for analysis of nitrogen containing compounds in mobile source emissions (NO, NO2, and NH3), Environ. Sci. Technol.,7, 51-54,1973.

Winer, A. M., J. W. Peters, J. P. Smith, and J. N. Pitts, Jr., Response of commercial chemiluminescent NO-NO2 analyzers to other nitrogen-containing compounds, Environ. Sci. Technol., 8, 1118-1121, 1974.

would be appropriate, as they deal with high temperature converters combined with NO-chemiluminescence analyzers.

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Remains the question, what is the added value of Nr in respect to eddy covariance (EC) measurements. Nr is an operational definition for the sum of a mixture of nitrogen containing compounds. So what is won, when knowing the deposition (or loss to the atmosphere) of nitrogen when not knowing which compound contributes. For a long term measurement the total nitrogen flux may be a useful information. For short term measurements as EC, the lifetimes of all comprising compounds would have to be taken into account. Especially, when the conversion factors of the TRANC are open for discussion.

So again, which of the nitrogen containing compound(s) of the composite would be relevant to or be utilized to which extent by the ecosystem is still open.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 7623, 2011.