

Interactive comment on “Measurements of total odd nitrogen (NO_y) aboard MOZAIC in-service aircraft: instrument design, operation and performance” by A. Volz-Thomas et al.

A. Volz-Thomas et al.

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We like to thank the referee for the positive review and for the critical remarks concerning the above manuscript. The main issues are inconsistencies in the presentation of the time response of the instrument and questions regarding potential interferences by CH₃CN and N₂O.

The flushing time for the reaction cell of our CLD is indeed 0.2 s, as pointed out by the referee. The time constant of the CLD is in fact shorter than the flushing time of the cell because of the decreasing NO concentration in the cell due to the chemical reaction of ambient NO with O₃. However, as correctly pointed out by the reviewer, the 90%

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response to a step change in NO₂ is 1 s, corresponding to a response time of about 0.3 s for changes in ambient NO_x. We apologise for this mistake and will change the entry in Table 1 for NO_x to < 1s. The response time (67% change) for HNO₃ is < 20 s, as was confirmed by additional tests made in response to referee #2. We shall add an explanatory note to the revised manuscript, pointing out that the instrument's time response doesn't follow a simple exponential law but can be best described by a double exponential function leading to larger time response for a 90% change than for a 67% change.

The mistakes in Fig. 1 noted by the reviewer will be corrected in the revised manuscript. The pre-reaction volume was adjusted from its original volume of 25 ml such that only about 90% of the NO are oxidised before entering the reaction cell. The pre-reaction volume is actually between 10 and 15 ml, depending on the efficiency of the ozone generator in use.

Conversion of CH₃CN and N₂O: No significant conversion of CH₃CN had been observed in earlier experiments with similar converters (c.f., Pätz et al., 2000). In view of the reviewer's question, we have repeated these tests by adding a small flow (0.01 ml/min) of an aqueous solution of CH₃CN (10-4 g/ml) to a flow of zero air, yielding a CH₃CN mixing ratio of 170 ppb. The corresponding change in signal (< 100 cps at a converter temperature of 300 °C) corresponds to a conversion efficiency for CH₃CN of < 0.2 %. Our results are somewhat different from those of, e.g., Kliner et al., 1997, who observed significant conversion of CH₃CN, albeit with lower efficiency than for HCN. We also repeated tests for N₂O by mixing a flow of 0.3 ml/min of pure N₂O with a flow of 1 l/min zero air yielding an N₂O mixing ratios of 300 ppm. The resulting increase in signal was < 50 cps, corresponding to a detected NO mixing ratio of < 120 ppt or a conversion efficiency of less than 5x10⁻⁵ %. Therefore, atmospheric N₂O causes a fake NO_y signal of less than 0.2 ppt in our converter. We shall add these findings to the revised manuscript.

A detailed discussion of the 15% difference noted in the in-situ comparison with the

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NO_y instrument of ETH-Zürich will be presented in a separate paper which is currently being prepared together with coauthors from ETH. Whereas we wouldn't like to pre-emphasise the findings of this paper, a strong influence of the aircraft skin on the NO_y measurements carried out aboard the Learjet is unlikely because the MOZAIC sampling inlet extended the estimated boundary layer of the Learjet by about a factor of two.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 6149, 2004.

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