Atmos. Chem. Phys. Discuss., 6, S107–S109, 2006
www.atmos-chem-phys.org/acpd/6/S107/
European Geosciences Union
© 2006 Author(s). This work is licensed
under a Creative Commons License.

Atmospheric Chemistry and Physics Discussions

Interactive comment on "In-situ comparison of the NO_y instruments flown in MOZAIC and SPURT" *by* H.-W. Pätz et al.

Anonymous Referee #1

Received and published: 24 February 2006

This manuscript presents results of an extensive inter-comparison of two NOy measurement systems aboard an aircraft. Since large data sets of these NOy instruments exist (mainly MOZAIC data), this work is an important contribution to assess the quality and uncertainty of these data. The paper gives a brief introduction to the intercompared measurement systems and addresses the main sources of uncertainties such as memory effects, conversion efficiencies and interfering species. Because NOy measurements are still relatively sparse and quality control is a major issue for such data sets, this work significantly contributes to the understanding of the processes that limit the capability of NOy instruments. It consequently should be published in ACP after clarification of the issues addressed below.

General Comments Since most part of the manuscript is of technical nature, more information about the instrumentation itself would be helpful for the reader. Currently only very brief descriptions are given. Results obtained with an invalid correction (temperature dependence of the conversion efficiency) are also shown and briefly discussed. Please consider to remove these data. It gives no valuable information for the reader. If you could clearly identify the error in the calculation, then this is something which is not substantial because it could be any difference. Consider to remove this from the final version of the paper. The discussion should only focus on the valid data set.

Specific Comments 652, 21: The conversion efficiency of 92% is lower than stated above (652, 9).

652, 22: “conversion efficiency of the MOZAIC instrument is independent of pressure”; was this tested? Please show results or give a reference if available.

652, 23: Please revise the terminology; inaccuracy might not be the correct term here; use overall uncertainty instead.

652, 25: The uncertainty of the conversion efficiency (above 652, 24) might be underestimated: Did you use the +-4% from the NO2 conversion to calculate the overall uncertainty? Do you have an explanation why the conversion efficiency of HNO3 was $>$92% and for NO2 “only” 92+-4%? I would expect the conversion efficiencies for NO2 to be higher when compared to HNO3.

653, 24: You account for the uncertainty of the background with 100 ppt (2 sigma). How was this number calculated? And why did you choose 150 ppt for background correction? Do you assume that the 200 ppt measured after the flight was still affected by memory effects? I also expect the “memory” effect to contribute significantly to the uncertainty of an individual measurement point, because some NOy is measured with delay.

653, 24: I would combine the uncertainties in this formula to have the result in the

ACPD

6, S107–S109, 2006

form of DNOy = sqrt ((a * NOy)ˆ2 + (b ppt)ˆ2). The individual contributors to the overall uncertainty should be better explained in the previous sections. Is the precision of 50 ppt (included in the formula) is for 1 s values; what time resolution was actually compared?

654, 13: Converter temperature?

655, 25: How was the 105 ppt determined? Please add more details. Was this number derived from zero checks?

656, 20: Please explain in more detail what you mean by “reproducibility of these experiments was much lower than for NO2”.

659, 13: Do you have an explanation why the three ensembles show “somewhat” higher or lower values? How were these three ensembles chosen? I can see data points which are more off compared to the data in the squares but which were still considered to be valid. General: I believe that a reason should be given when data is not considered for the evaluation. This is done only for one of the three squares. It is also not clear to me if this data was not considered at all (linear fit to all data) or not considered when level flights were compared.

660, 8: Review the terminology; I think inaccuracy should be replaced by uncertainty in this context.

660, 23: The discussion should more focus on the differences between the two instruments and the uncertainties of the other available data sets e.g. from MOZAIC. The explanations given for the differences are not all convincing to me; e.g. why should a change from warmer zero air to cooler ambient air reduce the conversion efficiency? The converters are heated, and the conversion efficiency increases with temperature. Thus such a behaviour is not expected at all and should be further discussed.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 649, 2006.