

## ***Interactive comment on “Auto MAX-DOAS measurements around entire cities: quantification of NO<sub>x</sub> emissions from the cities of Mannheim and Ludwigshafen (Germany)” by O. Ibrahim et al.***

### **Anonymous Referee #2**

Received and published: 19 April 2010

The paper is reporting an exercise of evaluation of the NO<sub>x</sub> emission of the two cities by mobile DOAS measurements from a car travelling around the area, following an idea explored by Johansson et al. (2008) for the city of Beijing.

General comments. Since the experiment is an application of the technique already proposed and discussed elsewhere, the question is to know what is the new information carried by this paper. In several aspects, one day of measurements in the summer between 10h45 and 15h compared to 2 campaigns of 2 and 3 weeks, average of surface wind measurements at three stations compared to the use of a meteorological model, the information provided by the new experiment is limited compared to the ref-

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erence experiment. The only potential progress is the use of Max-DOAS observations at 45° and 90° SZA instead of Zenith sky observations at 90° only. Therefore, a new publication would be acceptable only if the advantage of the Max-DOAS technique compared to zenith-sky is demonstrated and adequately quantified, which is not the case for the moment. Since a potential offset in the zenith sky measurements would have little importance in the present application based on the evaluation of the NO<sub>x</sub> enrichment between air masses entering and leaving the city, the advantage of the Max-DOAS is not obvious. In addition, even if the errors were small, I don't think that 4 hours of measurements on a single day in August, could allow a fair estimation of the average yearly NO<sub>x</sub> emission of the cities of Mannheim and Ludwigshafen.

Given the very limited useful information provided, I do not recommend publication of this paper as it stands today.

Specific comments I will not repeat the comments made by the first reviewer, which I share largely. However I will add a few, which might help the authors reconsidering eventually the paper

Title. What is the meaning of “auto”? The explanation comes far later in the text. I would suggest instead something like Mobile Max-DOAS measurements around the city of...”

Abstract: - the larger source of error is ‘probably” .. Why probably? I would suggest instead a list and if possible estimates of the respective contributions. - Surprising agreement. My understanding is that the estimated total NO<sub>x</sub> emission of the cities for the 24 August is . . . ., which if constant throughout the year would correspond to a total emission of X t/yr, consistent with. . .

Introduction - p 471 reference to GHG irrelevant. The DOAS technique do not allow measuring those.

References Max-DOAS observations, p 475. No need for the long list of references

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of Max DOAS measurements of various species at fixed stations. Not relevant here. One or two references describing the Max-DOAS technique would be enough. Other references. I would recommend the authors to look carefully at which references are relevant to the subject. There are many not really needed.

Errors The discussion of the impact of wind direction and speed variability is unclear to me. Not sure to understand the meaning of half standard deviation (see comments reviewer 1).

Table 2 shows large differences in errors between the 4 loops, said largely caused by the average wind direction compared to the most polluted part of the loop. In that case, why using loop 2 in the average? Instead it would be better to discuss the case and conclude that this configuration is not convenient.

Discussion/ conclusions: Most useful, after a summary of sources of errors, would be a thorough discussion of optimum conditions for evaluating the NO<sub>x</sub> emission of a city: minimum and maximum wind speed, wind direction variability and cloud cover, that is meteorological conditions; local time of measurements (chemistry, SZA, traffic); sampling and car speed; most pertinent ancillary data (wind measurements, altitude of boundary layer, in situ measurements from an air pollution network, meteorological model etc. . .), and finally, repetition of the measurements (week days, variety of meteorological situation, season..)

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Interactive comment on Atmos. Meas. Tech. Discuss., 3, 469, 2010.

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