

## ***Interactive comment on “Near-surface and path-averaged mixing ratios of NO<sub>2</sub> derived from car DOAS zenith-sky and tower DOAS off-axis measurements in Vienna: a case study” by Stefan F. Schreier et al.***

### **Anonymous Referee #1**

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#### General Comments

This paper presents near-surface and path-averaged mixing ratios of NO<sub>2</sub> derived from car DOAS zenith-sky and tower DOAS off-axis, measurements performed in Vienna city during several days on 2015 and 2016. This paper provides an useful intercomparison between tower DOAS, mobile DOAS and in-situ observations.

#### Specific Comments

Section 2 - Instrument and car journeys, in this section you should add few info about

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the in-situ instruments (type, error, etc.). Also please add a map (a new Figure) or include in Figure 1 the location of the in-situ monitoring stations and also the location of the DOAS tower instrument.

Please describe the tower DOAS instrument, I suggest you to introduce a Table with the technical characteristics of the two instruments (tower DOAS and mobile DOAS).

Figure 2. Could you explain the very low peak of intensity? Is it related to a tree, tunnel, or a bridge? Did you filter all the DSCDs function of RMS and O<sub>4</sub>?

Figure 3, please introduce the DSCD error. Also please introduce the error of each DSCD presented in the manuscript.

3.2.1 Temporal resolution and computation of horizontal NO<sub>2</sub> gradients- Could you specify the exposure time for the mobile DOAS instrument? (or this info could be included on the suggested Table for the two DOAS instrument).

3.2.2 Stratospheric NO<sub>2</sub> columns, Could you specify the error of Bremen 3d CTM (B3dCTM) model?

3.2.3 Conversion to tropospheric NO<sub>2</sub> vertical column densities SCD<sub>ref</sub>, could you specify why you don't have a SCD<sub>ref</sub> for each day? SCD<sub>ref</sub> is quite important if you want to have qualitative data. I suggest to the authors to introduce more details about SCD<sub>ref</sub> calculation, e.g. exact time of the selected SCD<sub>ref</sub>. SCD<sub>ref</sub> having  $1.3 \times 10^{15}$ ,  $1.1 \times 10^{15}$ , and  $2.2 \times 10^{15}$  molecules/cm<sup>2</sup> as tropospheric contribution could be realistic. Considering that SCD<sub>ref</sub> contain stratospheric and tropospheric contributions, did you cancel the stratospheric contribution? why do you refer to SCD<sub>ref</sub> as having only tropospheric contributions?

A chapter to describe the AMF calculation (using NO<sub>2</sub> profiles, albedo, geometry, PBL, etc.) is mandatory for this study, I suggest to the authors to use a table. Figure 6 should be part of this section and should include the AMF calculations for several days which are presented in this study.

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The authors should give more details about the error calculation of tropospheric NO<sub>2</sub> VCD, or a section of errors would be more appropriate.

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