

# ***Interactive comment on “High-resolution airborne imaging DOAS-measurements of NO<sub>2</sub> above Bucharest during AROMAT” by Andreas Carlos Meier et al.***

## **Anonymous Referee #2**

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The authors describe measurements of NO<sub>2</sub> above Bucharest by aircraft with an imaging UV/vis spectrometer. The paper focusses on the description of the retrieval chain and error assessment. The manuscript is suitable for publication in AMT after some minor corrections:

Major points:

Section 5: It is not fully clear to me from the text whether only the measured intensity of the centre wavelength of the NO<sub>2</sub> fit window was used or the whole spectral range. I assumed so since it is explicitly mentioned for the model intensities. However, the measurements are supposedly a vector. But it is not mentioned what the dimension is. In the first read I assumed it was the wavelength. Please add some more explanations

C1

in this section. Also, P. 16, L. 7: LUT of what? P. 19, L. 4: this is the first time that the text refers to the atmospheric correction explicitly.

Section 4.1.2: It's not explicitly mentioned that stratospheric NO<sub>2</sub> varies with the SZA due to photochemical reactions. For this the time step of the model is important. Please also add to Eq. (4) that the VCDs depend on the time. What happens when a model grid cell border falls within the study area?

Technical and other small corrections:

P. 1, L. 9: I suggest rephrasing the part with 'at the aircraft'.

P. 1, L. 10: apparent instead of seen

P. 1, L. 16: Please state coincidence criteria and sample size here

P. 2, L. 26-30: The most important property here is the trace gas species and not the location of the measurements. I suggest amending these sentences accordingly.

P. 2, L. 35: Last sentence. Maybe add a sentence why that is better.

P. 3, L. 21: Formatting problems for reference

P. 3, L. 25: '...overlap of the swaths between adjacent flight tracks...' That's difficult to understand without the instrument description first.

P. 3, L. 26-28: Please add the local time of flight since this is important in relation to the SZA and rush hour.

P. 4, L. 3: DOAS was introduced before

P. 5, L. 10: 'For data safety reasons...' Is that due to memory effects of the CCD chip?

P. 5, Table 2: The FOV\_along needs an aircraft speed to be meaningful.

P. 6, L. 1-7: I feel this information should be provided earlier on in the description. Also, I would sort the 4 sentences in the order of 2,1,3,4. Also, do you know what happens

C2

at the edges of the pixels?

P. 6, L. 7: Remove 'even' and 'individual'.

P. 6, L. 11: how many adjacent rows?

P. 6, L. 18: 'as is the case for 'some' satellite measurements'

P. 6, L. 21: This back-scattered radiance spectrum...

P. 6, L. 23: Replace 'close' with 'slightly smaller or equal'. What are the expected background values in percent in comparison to the enhancements when polluted?

P. 6, L. 32: '..., whose pixel center.' Please rephrase

P. 7, Table 3: 'Fitted absorption cross-sections and 'other' important settings...'

P. 7, L. 2: 'in aircraft turns'

P. 7, L. 5: add comma after second date.

P. 7, L. 7: How many spectra do you add up for the background spectrum?

P. 7, L. 8: 'Some slightly negative values...'

P. 7, L. 9: That sentence implies that those high values are caused by the pollution which is not the case. Maybe rephrase?

P. 7, L. 11: with high values enhanced by up to 50% in comparison to the rest of the plume?

P. 10, L. 3: 'can be computed'

P. 10, L. 25: Maybe add a sentence after the equation that you are discussing the individual terms in the next section.

P. 11, L. 5: 'each individual measurement': Not really mentioned before that this is done and how many spectra are combined. See also comment above.

### C3

P. 11, L. 5-6: Only for the respective observation geometry? What about aerosols and albedo here?

P. 11, L. 6: Refer back to equation (2) here.

P. 11, L. 16: Please add reference to support this statement.

P. 11, L. 24: Formatting issue for reference

P. 12, Table 4: 500m layer for NO<sub>2</sub>: Is that a valid guess? Where does this number come from?

P. 12, L. 8: I would suggest moving this sentence 4 sentences down. Figure 4 only supports the statement of the first half of the previous sentence. Hence it is a bit misleading here.

P. 12, L. 8: BAMF: either explain or give reference here.

P. 14, Figure 6: I suggest updating this figure if the authors feel artsy: The way it is sketched now implies that the instrument on the plane is scanning across track.

P. 14, L. 2: RAA is already described on the page before.

P. 14, L. 9: 500m: see comment above.

P. 15, L. 4-5: Why are there no measurements available close to the ground?

P. 15, L. 6: Why was the profile with the lowest AOD chosen?

P. 16, L. 15: Remove 'unfortunately'.

P. 16, L. 16: Remove 2nd comma.

P. 16, L. 29-30: But the surface elevation surely was not constant?

P. 17, figure 8: What is cts?

P. 25, L. 13: Remove 'very'.

### C4

P. 26, L. 22: And what is the error on the ADAM reference surface reflectance?

P. 28, L. 3: remove comma after larger.

P. 28, L. 6, 8: 'antagonistic' is poor choice. Maybe 'opposing'.

P. 28, L. 5: Remove 2nd 'in a'.

P. 28, L. 10: Remove 'a'.

P. 29, L. 10: do you mention somewhere what the absolute stratospheric column is?  
Maybe repeat it here.

P. 31, L. 1: 'scatter is smaller'.

P. 31, L. 9: Does that time lag correspond to the speed of the car?

P. 32, figure 20: It's a bit misleading in this case here that the top panel in Figure (b)  
doesn't have markers on it since there is this large measurements gap. Maybe break  
the lines to show this. Why not make it panels A-C?

P. 33, L. 21: Polar coordinate system?

P. 36, L. 14: What is APEX?

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