

Interactive comment on “Multiple wavelength retrieval of tropospheric aerosol optical properties from MAXDOAS measurements in Beijing” by K. Clémer et al.

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Answer to anonymous Referee #1:

- Sec 2, Line 21: There are several universities in Beijing, please provide more information, not only Physics Institute.

The Institute of Atmospheric Physics (IAP) of the Chinese Academy of Sciences (CAS).

- Sec 2.1, Line 25: BIRA-IASB stands for? Please explain!

The Belgian Institute for Space Aeronomy (BIRA-IASB)

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- Sec 4, line 25: physicality? What's that?

The term “physicality” is replaced by “geophysical consistency”.

- Figure 1: Figures should be self-explaining, i.e., the figure caption and/or a small table in the plot to the right side should be used to explain A, B, C, J, I, H G, F, D.3, D.1, D.2, D. The explanation is only given in the main text. That is bad.

A legend has been added to the Figure. (see added fig.)

- Figure 7: AOD values >3 or >4 are trustworthy?. A photometer would fail because the sun tracker would not be able to clearly see the sun disk because of rather large multiple scattering effects. So, a MAXDOAS can do a good job? Please comment on that!

The data shown in Figure 7 has not been screened for clouds. Most probably the very high AOD values result from the presence of clouds. In these cases the retrieved AOD does not reflect the truth. However, at this point we did not discard these retrievals from the time series as the retrievals might still be useful as input for the retrieval of trace gases such as NO₂, as explained in Sec. 4.3 line 10-25. In case of a high AOD originating from aerosol and not clouds, the MAXDOAS retrievals can still perform well. In contrast to the sun photometer, the MAXDOAS measures the scattered light (it is not necessary that the sun-disk is visible) and effects of multiple scattering are taken into account in the radiative transfer calculations. Of course, when the AOD increases the differences between the light paths for the different elevation angles becomes smaller and consequently the DSF will decrease. In these situations little information on the vertical profiles will be left, but total columns can still be retrieved.

- Figure 8: Exponential function are shown. Why not using just a surface value and a scale height? The other way around provide the respective surface values and the scale heights that fit to these curves.

The profiles shown in Figure 8 are not exponential functions. They are the monthly

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mean aerosol extinction profiles retrieved. These profiles are not constrained to have an exponential line shape. However, it is true that for measurements made in Beijing, the retrievals resulted, in most cases, in a profile with an exponential-like shape. But in August, for example, an uplifted layer was retrieved.

- Figure 9: Are you sure that the color plots reflect the reality (when keeping the poor height resolution in Figure 8 in mind)? Are you sure that the aerosol is confined to the lowermost 500 to 1000m over the polluted megacity of Beijing. Please comment on that critically.

Figure 9 reflects the smoothed broad structures of the aerosol. Due the limited vertical resolution, evidently, no fine structures will be resolved. As to the sensitivity at higher altitude, it should be noted that the weighting functions and consequently the averaging kernels reflecting the sensitivity of the retrievals depend on the aerosol load. As shown by the sensitivity study by Friess et al. (2006), when aerosol are present at higher altitude (between 1- 2 km), the sensitivity at these altitude increases.

- As mentioned above, there should be lidar measurements available. There is a Japanese lidar network in China, and one station is in Beijing. Please contact N. Sugimoto, MRI, Tsukuba, Japan. He is leading this network. I would appreciate in general, if more lidar comparisons could be shown.

We made contact with Mr. Sugimoto. LIDAR measurements were indeed performed in Beijing for our period of interest. Thank you for bringing this to our attention. We definitely intend to make a thorough comparison between the two datasets, from the moment that the data can be made available.

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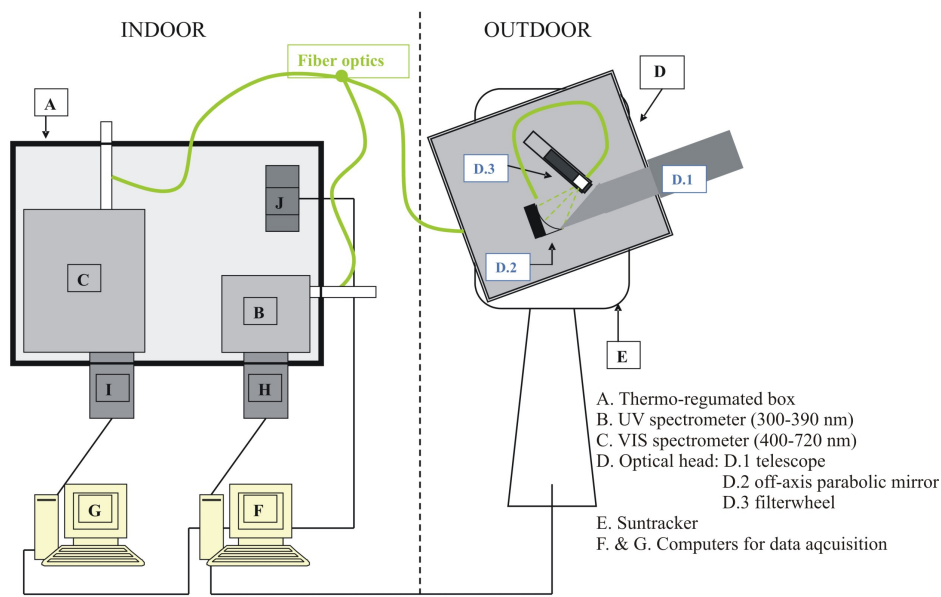


Fig. 1. Schematic view of the MAXDOAS instrument.

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