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Atmospheric Measurement Techniques Discussions

Interactive comment on "High resolution NO_2 remote sensing from the Airborne Prism EXperiment (APEX) imaging spectrometer" *by* C. Popp et al.

Anonymous Referee #2

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Review Comment on "High resolution NO2 remote sensing from the airborne Prism Experiment (APEX) imaging spectrometer"

C. Popp, D. Brunner, A. Damm, M. van Roozendael, C. Fayt and B. Buchmann

General impression:

The authors present a new method to derive two dimensional NO2 distribution maps based on the data of the APEX imaging spectrometer. The data are very interesting and demonstrate very well the possibilities offered by this instrument. However, up to now the APEX instrument is not that well known in the context of the DOAS retrievals

and trace gas distribution measurements, therefore it would be good to give some more details on the description of the instrument although this is clearly not the focus of the paper. The APEX spectra were originally not intended to be used for DOAS analysis. Therefore the spectral sampling interval and the spectral resolution are not ideal for DOAS retrieval, with a spectral resolution of roughly 1.3 pixels the DOAS retrieval is at high risk of under sampling. This seems to be either unclear to the authors (hard to believe) or they knew about the problem and solved it. However this point is completely ignored in the discussion of the data and the retrieval. Please add short paragraph on this topic.

Specific comments

2.2 Test side and data

P2453 L13 Is there any reference concerning the APEX acceptance flight campaign. Please give some details on the campaign, e.g. used aeroplane, flight altitude,... In the current version of this sections it seems this campaign should be known to everyone and the APEX is flying by itself.

P2453 L15-20 The instrument was operated with a fixed integration time, is it possible to adapt the integration time? Why was this integration time used? The spectra in figure 2 look quite dark for large parts of the spectrum. For future mission I suggest sacrificing parts of the spectrum (with wavelength higher than 700 nm) and getting better spectra in the interesting interval.

3.1 DOAS analysis

P2456 L5-12 The section concerning the reference spectra is unclear, please try to explain differently. According to the figures you used one reference per over flight. Did you try to use one for all 3 flights? Does this help to reduce the difference between individual over flights. See also general comment concerning under sampling.

4.1 SCD analysis

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P2460 L15 The authors seem to expect the dSCD to resemble a Gaussian distribution. Why should that be the case for the NO2 dSCD over Zurich or any other city?

4.2 NO2 spatial distribution

P2462 L5 Without going into details of the model, but does this model have a weekly cycle included? So it should be possible to retrieve a typical Saturday NO2 distribution.

4.3 examples of source identification

P2464 L27,28 There was northerly wind on this day, hence the planes most probably came in from the south and took of towards the north. Does this affect your data? Please zoom in a bit more on the waste incinerator. The background NO2 is quite high and the variability also, so the plume is hard to detect in the picture (11d-e). Did you try to estimate the source strength? This should not change during the course of the day, hence morning and afternoon flights should be comparable.

4.4 Comparison to ground based measurements

P 2465 L 25 To calculate the AMF the authors assumed a certain NO2 profile, thereby the VCD might be used to calculate the ground based concentration, however this would not change the regression as the it adds a constant factor on the VCDs. On the other hand it should at least be in a similar range.

Figures

Figures 9 and 10 Both figures show time series of some independent measurements. However two different time scales are used, this is a bit inconvenient for the readers.

Figure 11 Zoom in a bit more in the pictures d) and e).

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 2449, 2012.