

## 一、 Comment of amtd-2-C760-2009

### Specific comments

1 .

P. 1665, L. 3: add a reference for the importance of MH determination in air quality modeling. It might also be interesting to mention to degree of accuracy that is necessary for such model validation or for use as an input. Does the new method matches the required accuracy?

Reply: Thanks very much! We have added one reference in text. Our results have good agreement with those data derived from meteorological observations and MESSy, which shows our new method is reliable. It should have high time resolution of about 1 h or less and vertical resolution of about 10-30m or less, which is necessary for use as an input in air quality. Our new method could match the temporal and spatial resolution, since at present none of the profiles analysis and models is accurate, thus it still need more research and comparison.

2.

P. 1667, L. 18 and Figure 3: I find this way of presenting results not very efficient. Why not simply show the diurnal variation of the retrieved ETMH for this particular day (only one plot would be necessary to do this) and explain that it is consistent with expectations?

Reply:

Fig. 3 is expected to illustrate the method of this paper to retrieve ETMH, under the assumption that the mixing layer mixed very well, passive DOAS and active DOAS should have same measurement result if corrected mixing height to be used to convert active DOAS results to vertical column density (VCD), according to this example, we can get the idea to retrieve ETMH by combination passive and active DOAS. Fr efficiently showing the method we have added the diurnal variation of the retrieved ETMH of this day in Fig 3d.

3.

P. 1668, L. 5: If Figure 3 is modified according to me previous suggestion, it will be easy to show results for the two different assumptions (constant concentration or constant mixing ratio) and to demonstrate that the impact is small.

Reply:

As we mentioned, vertically constant trace gas concentration or constant mixing ratio could be used in the method alternatively, since in standard condition, gas column concentration and mixing ratio in 1km column can convert to each other by the factor of  $2.68E15$ . Within boundary layer( about 0 to 2km), pressure and temperature have relatively little variation, so the impact of P and T are small in this method. if we convert gas column concentration to mixing ration in this paper, the same result could

be expected. So we just present one assumption in this article.

4.

P. 1675, L. 9: please expand of this. In which way the simultaneous measurement of different molecules will bring information on their respective lifetimes ? Is it through the resulting differences in profile shapes that will affect the determination of the ETMH. If this is the idea, explain how such differences can be quantitatively converted into the lifetimes.

this has been removed from text.

5.

Figure 5: Also May data are suspicious in this plot. Explain the possible reasons for it.

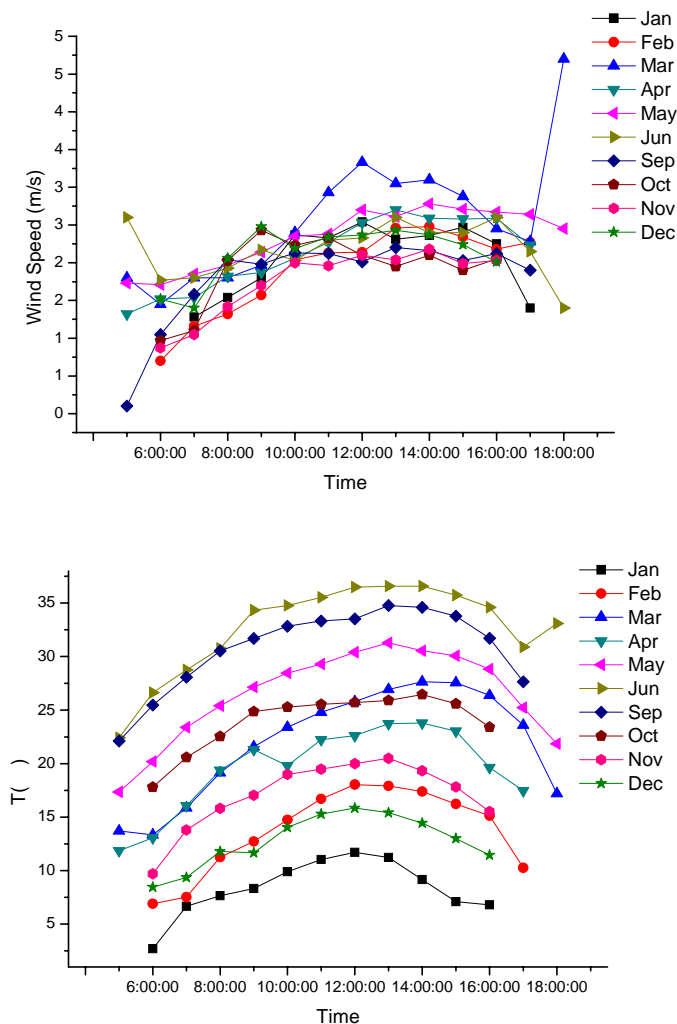


Fig.1 The average daily variation of wind speed and surface temperature in each month

Reply:

May data is a little higher in Fig 5. We think there are two reasons for it. We have

investigated the relationship of the derived ETMH to temperature and wind speed in text and found correlation coefficients of 0.65 and 0.37, respectively. From Fig 1, we can see that the average surface wind speed in May is very high, only lower than March (spring), and May has the third highest surface temperature. Thus a little higher ETMH in May is reasonable. Besides, low surface concentrations derived from the active DOAS could result in high values of ETMH in May, seen in section 5 Errors of the method in text.

6.

Figure 8: the last sentence of the caption is unclear. Explain that values are unrealistically high probably because of the occurrence of a second NO<sub>2</sub> layer due to transport from distant pollution sources.

Reply:

(I think it is Figure 9, not 8), delete “~~and even the lowest values exceed 0.88 km~~”, because in our method, NO<sub>2</sub> concentration above mixing layer is assumed to be zero, if there is second NO<sub>2</sub> layer above mixing layer, the measurement result of NO<sub>2</sub> column density in mixing layer will be overestimated, there is an explanation in the paper, Please see second paragraph in Sect. 5.

7,

Figure 10: these plots are too small and impossible to read.

Reply:

We have enlarged them in paper.

8.

Comments of editorial nature:

Overall the clarity and readability of the manuscript could be improved with the help of a native English speaker.

P. 1666, L. 11: replace “substantial” by “substantially”.

P. 1666, L. 16: remove “of” between “analyzing” and “the integrated”.

P. 1667, L. 20: replace “VCD\_EMTH” by VCD\_ETMH”

P. 1668, L. 1: replace “To reduce a possible cloud influence ...” by “To reduce the possible influence of clouds on ...”

P. 1670, L. 14: for the sake of clarity, please reformulate the sentence “..., which illuminates the ETMH variation is opposite to temperature, ...”

P. 1670, L. 19: replace “Table 3 show...” by “Table 3 shows...”

P. 1671, L. 20: replace “The second point can become important especially...” by “The second assumption might not be fulfilled especially during winter...”

P. 1672, L. 13: reformulate this sentence, e.g. “In a recent analysis covering 15 years

from 1990 until 2004, Yang et al. presented of MH variations determined in Shanghai at 2:00, ...”

P. 1672, L. 18: replace “..., they might well be representative ...” by “..., the can be considered as representative of ...”

P. 1673, L. 1: remove “is” between “occurs” and “at”

P. 1673, L. 14: replace “... in the free troposphere is 2 of that ...”, by “... in the free troposphere is twice as low as in the mixing layer...”

Reply: Thanks very much! Please seeing the modification in text.