Atmos. Chem. Phys. Discuss., 7, S2976–S2979, 2007
www.atmos-chem-phys-discuss.net/7/S2976/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ground-based measurements of tropospheric and stratospheric bromine monoxide above Nairobi (1° S, 36° E)" *by* S. Fietkau et al.

Anonymous Referee #2

Received and published: 9 July 2007

Fietkau et al. present measurements of BrO with a ground-based MAX-DOAS instrument located close to the eqautor in Nairobi, Kenya. They use 5 different elevation angles to derive total, tropospheric and stratospheric columns. They compare the stratospheric data to model calculations and find an improvement of the model results if the reaction of $BrONO_2$ with $O(^3P)$ is included. They derive tropospheric vertical profile information and estimate that the bulk of tropospheric is located at an altitude of about 3km. Overall this is a very interesting study that improves our quantitative understanding of stratospheric bromine chemistry and adds to a growing number of evidence for the widespread presence of BrO in the free troposphere. As had been shown by global model calculations even small numbers would have an impriotant effect of tropospheric

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ozone concentrations. I have only minor comments and suggest publication after these have been considered.

General coments:

(i) Parts of this paper seem to have been written with the stratosphere inmind but without explicitly mentioning this. Please re-read the paper considering this and adding, where necessary, "stratospheric" to make it easier for the reader to tell the differences of stratospheric and tropospheric chemistry. I list below a few examples:

p. 6529, last paragraph; p. 6530, l. 6/7; p. 6530, l. 27 to p. 6531, l. 3

(ii) Measurement errors: No eror bars are given on the plots and I haven't found any discussion of errors in the text. This should be added as I assume that the errors will be substantial.

Specific comments:

p. 6528, l. 9/10: This diurnal variation is fairly small and possibly within the errors. Please justify better in the main part of the paper that this difference is really significant.

p. 6528, l. 24: Nowhere in the text I could find information about the actual altitude of the measurement site other than "high altitude". Please add in abstract and last para of section 2. Also: does "3km" at beginning of this line refer to "above ground" or "above sea level"? 7 p. 6529, l. 2: WMO 2002 is not in references, also consider citing the new report WMO 2006 which was published early this year.

p. 6529, l. 10: beeing –> being

p. 6529, l. 24/25: please add reference for this statement.

p. 6530, l. 20: Kaleschke et al don't discuss or show O_3 depletion by BrO

p. 6530, l. 23: Gabriel et al don't show BrO but Br^- measurements!

p. 6533, l. 11 - 18: I couldn't follow this explanation. When talking about the diff in SZA

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90 - 80 and 80 - 90 degrees: do you refer to differences in sunrise and sunset? Please rephrase this paragraph.

p. 6536, l. 7: Explanation of morning - evening diffs: are they explained quantitatively by your model? This could be explained in more detail.

p. 6536, l. 9 - 10 and remainder of para: Where was this described ("mentioned above") and is this statement really correct? Is the input of Br into the stratosphere really constant? What do you base this statement on? Also, to me there IS a clear seasonal difference in NO_2 (especially in the evening values) with about 30% of the total column. Please improve this paragraph with these points in mind.

p. 6538, l. 20 - 21: This should have been clearly mentioned in section 4.1 already.

p. 6538, l. 22 - 24: Please add numbers for the light paths for the different viewing angles.

p. 6539, l. 13 - 18: Please explain this in more detail, especially the "cross-over" of the different viewing angles at SZA of between 60 and 70 degrees (see fig. 6).

p. 6540, l. 7 - 10: Please explain more, I didn't understand why the information content for greater altitudes is less. Also: does this potentially affect the derived max. altitude of the BrO peak in the troposphere?

p. 6540, l. 17: Leser et al explain clearly that they saw a boundary layer signal, not free tropospheric!

References:

Pundt et al. 1999a: please drop the "a" there is only one Pundt et al 1999 reference

reference for WMO 2002 missing

WMO 2006 was published in 2007 not 2006.

Figures:

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Fig 4 and 5: please change order as fig 5 is refered to in text first.

Fig 5: If I'm right, the lines for "MODEL clima PM" and "MODEL ECMWF PM" almost overlap. Please mention this in caption to make it easier for the reader.

Fig 8, caption: What does "about 1.5 independent pieces of information" mean or refer to?

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6527, 2007.