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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Estimates of free-tropospheric NO_2 and HCHO mixing ratios derived from high-altitude mountain MAX-DOAS observations in the mid-latitudes and tropics" *by* S. F. Schreier et al.

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We would like to thank the reviewer for his / her useful comments.

In this work, MAX-DOAS data sets from observations at two mountain locations are analyzed to obtain NO2 and HCHO mixing ratios in the free troposphere. The analysis is based on a modified geometrical approach proposed by Gomez et al. (AMT, doi:10.5194/amt-7-3373-2014), which assumes a single scattering geometry and a scattering point altitude close to the instrument. The manuscript is well written and

provides information on species that have been little studied. Especially the long period of time analyzed make this study interesting. I recommend this manuscript for publication in ACP after minor revisions.

Minor comments:

- The field of view of the instrument is not mentioned at all in the paper. This has to be taken into account specially when analyzing data from Pico Espejo.

We have now added some information about the instrument's field of view and added two references for more information about the MAX-DOAS system:

"Scattered sunlight entering the telescope, either from the zenith or horizon window, is focused by a lens to reduce the field of view before it reaches the optical fibre mount. During the instrument's operation at the two measurement stations, a field of view with an opening angle of $\sim 1^{\circ}$ was achieved (Oetjen, 2009 and Peters, 2013). Consequently, the signal in the horizontal path might be slightly affected by the contribution of trace gas absorption at lower altitudes (up to 500 m below the measurement stations at the end of the hOPL). Nevertheless, the mixing ratios as presented in Sects. 6.3 and 6.4 for NO2 and HCHO, respectively, are still considered to be representative for the free troposphere."

- I think Fig. 1 does not add more information than the given in the text. It may be removed. Or, is there an estimation/equation to add?

We partly agree with this comment. However, as we have used these two scenarios for the radiative transfer simulations, and refer to this figure when describing the two scenarios in the text, it might be useful for the reader. We would prefer to keep this figure in the manuscript, although it does not include any equation.

- The symbol for degrees (°) by describing elevation angles is missing in this new version.

This change was introduced during typesetting. There is a symbol for degrees (°)

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always only after the last value (e.g. 90°). This scheme can also be found in other ACP publications, for example in Gomez et al. (2014).

- Is there any reason why could be or should be BrO included in the HCHO analysis? (apart from the obvious one that BrO absorbs in this spectral range)

It is common to include BrO in the HCHO analysis (e.g. Roscoe et al. (2010)) as there is spectral interference between these two species and the presence of BrO in the free troposphere cannot be excluded.

In addition to the reviewers' comments, we have performed some minor changes: - In the ACPD version, References from Table 2 are not included in the reference list. We have now added them to the reference list.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 31781, 2015.

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