

Interactive comment on “Determination of aerosol properties from MAX-DOAS observations of the Ring effect” by T. Wagner et al.

Anonymous Referee #1

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The paper addresses the relevant scientific question of whether Ring effect and O₄ provide different information on the state of the atmosphere. This paper presents novel data. A substantial conclusion is reached on the information provided by the Ring effect with regard to the aerosol asymmetry parameter (not provided by O₄ absorption). The scientific methods and assumptions are valid. The description of experiments and calculations is sufficiently complete and precise to allow their reproduction by fellow scientists. The reader assumes a 1 km vertical grid is used in the RT model. The authors give proper credit to related work and clearly indicate their own new/original contribution. The number of references is very good. The quality of the references is appropriate, although it makes more sense to reference peer-reviewed journals than books, which are probably not refereed (e.g. Platt and Stutz, 2008). The title clearly reflects the contents of the paper. The abstract provides a concise and complete sum-

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mary. The overall presentation is well structured and clear. The language is fluent and precise, except in a few instances (see technical comments below). Abbreviations etc. are correctly defined and used.

Scientific comments

The speculation that Ring effect observations at large SZA might become a “well-suited tool” to retrieve stratospheric optical depth is questionable because, as the authors note, the stratospheric aerosol optical depth is rather small compared to the tropospheric aerosol optical depth and thus any changes in tropospheric aerosol optical depth would affect the retrieval of stratospheric aerosol optical depth. It is not sufficient to show that stratospheric aerosol optical depth changes are detectable, but that “interference” from changes in tropospheric aerosol optical depth can be separated or at least flagged.

P741L11 “From these findings it is concluded that from observations of the Ring effect information on aerosol properties like optical depth, profile shape or asymmetry parameter can be obtained.” The conclusion that profile shape information can be obtained is not supported by the observations. I suggest that the authors demonstrate this point further or remove the claim.

P741 After presenting their radiance and radiance ratio results, it would make sense if the authors also discussed whether the Ring effect offers more sensitivity to certain atmospheric information than these two observables. Currently, the discussion stops after contrasting information obtainable from Ring effect and O₄ absorption.

P734L15 “Like for the O₄ AMF, the Raman scattering probability decreases in general with increasing aerosol optical depth.”

Some insight here explaining why this occurs for O₄ AMF would add to this paper (...optional).

Remaining technical comments:

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Some of the figures should be redone so that, in particular, the y-axis range is almost fully utilized.

As is done in Figures 4a-b, 9 and 10, Figures 3a-b and those in the appendix should have the bias removed (due to the reference spectrum). This makes the RSP seem like a more meaningful quantity. Figure 3 currently has negative measured RSP values (which of course is possible given that the reference spectrum contains Ring signature as well).

Why is the panel for an elevation angle of 90° left out of Figure 4d?

“...independent on...” -> “...independent of...” (2 occurrences)

“...overview on...” -> “...overview of...” (2 occurrences)

P733L24 “...telescope...” -> “...telescope...”

P736L18-19 “...because more photons are scattered from the side into the line of sight having a larger probability to be scattered on molecules.” This is still not a sentence.

P737L3 “...of surface near aerosols,...” -> “...of near-surface aerosols. ...”

P738L15 “Both assumed stratospheric profile...” -> “Both assumed stratospheric profiles...”

P738L20-21 “...compared to those of the surface near the aerosol scenarios, ...” This is not a sentence.

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 725, 2009.