

## ***Interactive comment on “Technical Note: Cloud and aerosol effects on rotational Raman scattering: Measurement comparisons and sensitivity studies” by A. Kylling et al.***

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Response to interactive comment from Referee #3

The comments from Referee #3 are not numbered. They are answered in the order presented by Referee #3.

- 1 The term “Ring effect” and the Grainger and Ring reference has been included in the introduction.

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- 2 The term “cloud-top pressure” has been changed to “cloud pressure”.
- 3 The description of the various code references have been reviewed and corrected.
- 4 Absorption by ozone and the oxygen dimer have been included in the calculations made for the revised manuscript. The value of the NO<sub>2</sub> column is stated in the manuscript.
- 5 The thunderstorm spectra in Fig 1a have been scaled by a factor as suggested. The scaling has been documented in the figure caption and in the text. Scaling has also been applied to Fig 2a.
- 6 We have changed the sentence such that the improvement only applies to the thunderstorm situation and to the peak of the calcium absorption lines for the cloudless situation.
- 7 Please see answer to Specific comment #12 of referee #1 and General comment #8 of referee #2
- 8 The differences seen around 400 nm in Fig. 1b in the original manuscript is not caused by values of the assumed input parameters to the model as they exhibit no such wavelength dependence. Thus the only source for this discrepancy are measurement uncertainties. Concerning the high spectral differences in Fig. 1b please see answer to Specific comment #12 of referee #1 and General comment #8 of referee #2.

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**9** The background for the choice of input parameters has been included in the revised manuscript.

**10** Please see point 7 above.

**11** The quoted sentence has been rephrased. The model simulations include the changes in solar zenith angle during the recording of the spectra. This has been clarified in the text.

**12** The mentioned Fig. 3 has been removed from the revised manuscript as suggested by referee #2.

**13** The inconsistencies in Figs. 4 and 5 of the original manuscript were caused by a problem with the Fortran implementation of the RTE solution. The solution of the RTE has been reimplemented in a new C-version of the DISORT RTE solver (Buras et al., 2011). The mentioned inconsistencies are no longer present, please see Figs. 3 and 4 in the revised manuscript.

**14** Please see comment above.

**15** The LER results have been removed from the revised manuscript.

**16** The peak at about 4 km for a cloud optical depth of 10 was not real and due to the problem with the Fortran implementation mentioned above. The filling-in for BOA depends on the cloud bottom altitude. In the original manuscript the cloud

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- bottom was at a fixed altitude and the cloud thickness was increased as the cloud top increased. For the revised manuscript simulations with both a fixed cloud bottom, increasing cloud top, and increasing cloud bottom and cloud top have been performed. The results are included in the revised Fig. 3 and discussed in the revised manuscript.
- 17** This section has been removed from the revised manuscript. The figure contained little new information as mentioned by referee #2.
- 18** The figure has been better explained in the text. Global irradiance is the sum of the direct and diffuse downward irradiances. As there is no direct upward irradiance global upward irradiance is the same as the diffuse upward irradiance. This has been clarified in the text.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 22515, 2010.

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