

Interactive comment on “Atmospheric effects of volcanic eruptions as seen by famous artists and depicted in their paintings” by C. S. Zerefos et al.

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Response to the comments by B. Mayer

We would like to thank B. Mayer for his detailed comments and suggestions which helped a lot to improve our discussion on the uncertainties of our AOD estimates. Most of his suggestions are discussed in the revised manuscript in a new section 3.4 where the uncertainties in the model calculations are also discussed. More specific:

Concerning point 1 of his comments, the use of RGB diffuse irradiance values directly calculated from the model, using the CIE color matching functions, result to systematically higher R/G ratios for SZA <85deg compared to the ones estimated taking the ratio of certain wavelengths. These differences are demonstrated in the following table. For SZA>85deg the ratios from the RGB calculations become smaller. However

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these differences are systematic and therefore their effect on estimating the AOD is considered together with other sources of systematic bias in the calculations versus measurements.

sza aod r/g(old) r/g(new) diff%

65 .1 0.85 .96 12.9

75 .1 0.91 .97 6.6

Concerning his comments 2 and 4 we re-calculated the R/G ratios shown in figures 1 and 2 using the integral of the calculated radiances within 20o azimuth around the setting sun and for zenith angles 70-90deg using a 20deg horizontal, 10 deg vertical grid. Here we have to consider however that the sdisort solver included in libRadtran is only a pseudo-spherical but not a fully spherical code, and therefore we will present here only calculations for SZA=70deg where the accuracy of the model is acceptable.

The R/G ratios based on radiance calculations for volcanic and non-volcanic aerosols are presented in the next table for 2 AOD values

Aod R/g non volcanic R/g volcanic

0.1 0.88 0.89

0.5 1.12 1.25

The values are considerably higher (especially for non-volcanic conditions) than those proposed in figure 3. For the higher AOD values the results from model and paintings are very close and thus most of the bias is eliminated when we use the radiances for the calculation of R/G ratios. However we cannot extend our calculations for higher zenith angles since the use of radiance values for the retrievals is limited by the increased uncertainty of the 1-d model for higher solar zenith angles .

The references have changed according to B. Mayer's comments.

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