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Atmospheric Chemistry and Physics Discussions

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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General comments

This paper presents a fascinating new analysis of the colours used in famous sunset paintings in an attempt to glean useful information about the past stratospheric aerosol loading for the period 1500-1900. On the whole, the paper is very clearly and concisely written, and represents an extremely useful addition to the literature. I have a few minor comments on typos etc. listed below. My main scientific criticism is about the treatment of errors and uncertainties in the analysis, which I think needs to be improved before final publication in ACP.

Specific comments

Firstly, I think there may be some uncertainty introduced by the use of a variety of cameras (and camera usage) to obtain the digital images displayed by each gallery. As I am not an expert in digital photograph analysis, I am not sure how important this is, but I would expect the red/green (R/G) ratio to vary somewhat with photographic technique and equipment, e.g. flash versus daylight, exposure time, Nikon versus Pentax etc. Can the authors reassure us that this is a minor influence?

Secondly, given that there is some level of uncertainty in the R/G ratio (as indicated in Table A1 - typical uncertainties seem to be +/-0.05), and that there is also uncertainty in the solar zenith angle (SZA) at the time of the painting (as discussed in Section 3.2), then this must translate into an uncertainty in AOD. Looking at Figure 4, in certain instances, the uncertainty in AOD may well be very large indeed. For example, if R/G is 0.95 +/- 0.05 and SZA is 85 degrees, then the corresponding AOD range is about 0.22 to 1.0 - mainly due to the shallow slope of the AOD v. R/G line. Clearly, adding a further uncertainty in SZA will extend this range even further. There may be mitigating circumstances that rule out certain combinations, forcing the AOD range to be generally smaller than this example, but I would like to see error bars on the AOD estimates, particularly in Figure 6. Would the introduction of error bars affect the resulting correlation coefficient? I am guessing that the few points at high AOD would have large error bars.

Thirdly, I am confused about the 30% bias between the R/G ratio obtained by the model compared to that found in the paintings (Figure 3 and Section 3.2). I don't understand the origins of this bias - e.g., is it a radiative transfer model deficiency, or is it a consequence of the fact that the artists cannot paint instantaneously, so the SZA must change whilst they paint? This seems to me to be another significant source of uncertainty in the results that is not adequately explained.

I note that the comment from Bernhard Mayer also raises some of these issues and offers some explanation; however this review was undertaken independently of his comments.

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If the authors address these points (and the minor points below) then I would recommend publication in ACP.

Technical corrections

p5147, l8: observation -> observations

p5147, l17: insert spaces in web address - artaodformoredetails -> artaod for more details

p5149, l24: that obtrained -> obtained

p5150, l10: 1874 -> 1784 (?)

p5151, l23: as visible light -> as the wavelength of visible light

p5154, l3: (over 2,10) -> (over 2.10)

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 5145, 2007.