Reply to comments by anonymous reviewer #2:

Note that our responses are indented, bold and italicized

The manuscript challenges the notion that historical paintings can be used to quantitively assess the amount of stratospheric sulphate aerosols following major volcanic eruptions, based in particular on a series of sensitivity tests with an atmospheric radiative transfer model.
In general the manuscript is clear and well written, and it could be of interest to Climate of the Past readers.
I think that already in the introduction the authors should clarify the premises of this study, as the readers may not be familiar with all the background facts, for instance by concisely but explicitly addressing the following issues:
Why do you focus on near-horizon radiance (e.g. evenings)?
Why do you focus on the red/green ratio?
How do you know that the painting is depicting the evening?
How do you know that the painter's style was realistic in reproducing the colors?
How do you know that pigment conservation allows for estimating the original colors faithfully?

Reply: We thank the reviewer for these constructive comments. We tried to incorporate the reviewer's suggestions in the introduction and hope they enable the reader to better understand the context of the study. We are, however, not entirely certain we fully understand the reviewer's comments, because we are criticizing some of these assumptions, i.e. the last three questions posed by the reviewer. We now at least mention these aspects in the introduction and we hope that by doing so we did follow the reviewer's intention.

Specific comments

9) Krakatoa?

Reply: Thank you, changed!

55) "The troposphere was assumed to be free of aerosols". This appears to be a strong assumption. Was there a basic sensitivity test at least, to justify this? No reference is provided either, of why this assumption should hold.

Reply: This is a good point, and we carried out a simulation with tropospheric aerosols. Adding a tropospheric component with an AOD of 10% of the total AOD (i.e. 0.03 for a total AOD of 0.3) leads to only very small differences (less than 0.5 %) in the colour ratios for SZA < 90 deg. For SZA > 90 deg, the differences can reach up to 10%, but the overall conclusions of the study are not affected. For most (or all) scenarios associated with historic paintings, the tropospheric AOD and the characteristics of the aerosol are not well known and add further complications when trying to infer AOD information from the paintings. We added a statement to the paper briefly discussing tropospheric aerosols.

Table 1) If I interpreted the parameter values correctly, the central case is that of painters reproducing on canvas what they see in front of them, just before sunset, while giving their back to the setting sun. Is that correct? Maybe it's worth spelling this out.

Reply: Thanks for this question. The basic viewing geometry is that the observer is looking in the solar direction, not in the anti-solar direction. We added the following sentence to section 2.1 to make this point clear:

> ***"Note that the range of solar azimuth angles considered implies that the observer is looking in sun-ward direction."***

In addition, the following statement was added to the sentence in the caption of Table 1, where the meaning of the solar azimuth angle is explained:

> ***"i.e. an SAA of 0° means that the observer is looking in the direction of the sun;"***

59) Since the red/green ratio is relevant here, and the application of tristimulus values implies using specific wavebands, it would be worth seeing a curve of RI vs wavelength

Reply: We are not sure we understand this comment properly. You are asking about the wavelength dependence of the refractive index, right? This wavelength dependence is considered in this study. However, the spectral dependence of the real part of the refractive index is very small. It changes by only 0.003 when going from 500 nm to 700 nm. The refractive index data are taken from the OPAC (Optical Properties of Aerosol and Clouds) database implemented in SCIATRAN.

We now mention in the paper that the spectral dependence of the real part of the refractive index of sulfate aerosols is considered in the simulations.

85) Why not showing a plot of the tristimulus values wavelength dependence?

Reply: We did not include it at first, because in a previous publication (where we showed this plot) one reviewer asked to remove it, because it is standard textbook knowledge. But we follow the reviewer's suggestion here and have now included such a plot (Figure 2 of the revised manuscript).