Earth Syst. Sci. Data Discuss., referee comment RC1
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# Comment on essd-2021-143

Jay Herman (Referee)

Referee comment on "Advanced $NO_2$ retrieval technique for the Brewer spectrophotometer applied to the 20-year record in Rome, Italy" by Henri Diémoz et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-143-RC1, 2021

This paper is a very useful addition to the science of detecting total column $NO_2$ in the atmosphere using widely available Brewer Mark IV spectrophotometers with a newly developed algorithm. The paper is mostly well written with minor language corrections needed (see attached document with corrections marked in green). The description of the equations used in the new algorithm is deficient. This needs to be fixed before publication. The derivation of the algorithm can be in the main paper, appendix, or in supplemental material. As it is now, it is not possible to follow the derivation of equations 1 to 3 and more detail for the remaining equations 4 - 7. The results are important enough so that the included equations must be understandable for use by others. The comparison with Pandora 117 is quite good, However, even more interesting is a comparison of Brewer 067 with the daily files from Pandora 117. I have included in my review graphs for such a comparison for 8 days in 2017. The new algorithm does an excellent job. I will be happy to share the originals of these figures if you wish (see the end of the attached document). My recommendation is that this paper needs an improved/extended description of the equations before being published. Other than that, this paper is an important addition to atmospheric experimental science.

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Please also note the supplement to this comment:
https://essd.copernicus.org/preprints/essd-2021-143/essd-2021-143-RC1-supplement.pdf