

Atmos. Meas. Tech. Discuss., referee comment RC1  
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## Comment on amt-2021-89

Anonymous Referee #1

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Referee comment on "Boundary layer water vapour statistics from high-spatial-resolution spaceborne imaging spectroscopy" by Mark T. Richardson et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-89-RC1>, 2021

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I congratulate the authors for a good study and a good statistical work.

I have some minor comments:

\* general:

- I miss a lack of comparison with real data. The spatial uncertainties resulting from this study could have been compared with real data under similar conditions as the simulations (e.g. flat-terrain, etc..)
- In such detailed statistical work I miss also an estimation of the order of magnitude of the contribution of the different approximations in the model to the final results.

\* page 1:

- "... upcoming missions such as the Earth Surface Mineral Dust Source Investigation (EMIT) will offer unprecedented horizontal resolutions of order 30 - 80 m..." -> currently there are several missions (VNIR - VSWIR) with this or even better resolution (e.g. multispectral Sentinel-2 (20 m) and hyperspectral DESIS) with bands in the water vapor absorption regions. Actually, wouldn't it be more sound to make this study with the Sentinel-2 20m resolution?.

The study would also profit of the large amount of real data, which leads me to the first general comment.

\* page 7:

- is a plane-parallel atmosphere still a good approximation for SZA = 45?. The effect in  $\sigma_{\max}$  seems to be of the order of 0.025 (figure 12), the same as the difference between 50 - 300 m resolution. This could be included in the second general comment.
- I did not find the Supplementary figures

\* Page 10:

- The difference between different surface brightness seems to be of the same order of

magnitude of the dispersion within the same surface brightness. And there is a much larger offset between the retrieved TCWV and the true one. The offset seems to be smaller for brighter surfaces, but there is still 1mm difference for 50% retrieved surface reflectance.

\* Page 15:

- which is the typical error of Isofit with respect to WV true measurements?
- which depend the TCWV variability of -7% to 34% of?. E.g. Is it a function of the true TCWV?
- I have missed some conclusions for smaller spatial resolutions sensors.

If some of my comments are already explained somewhere in the text, I would thank the authors to point me to the section containing the explanations.

Unfortunately I did not have the chance to read the article in a row and I might have missed some of the explanations to my comments.