

Atmos. Meas. Tech. Discuss., author comment AC2
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Reply on RC2

Xavier Calbet et al.

Author comment on "Horizontal small-scale variability of water vapor in the atmosphere: implications for intercomparison of data from different measuring systems" by Xavier Calbet et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-111-AC2>, 2022

Answers to the reviewer are highlighted in bold and sentences started with **

Comment on amt-2022-111

Anonymous Referee #2

Referee comment on "Small scale variability of water vapor in the atmosphere: implications for inter-comparison of data from different measuring systems" by Xavier Calbet et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-111-RC2>, 2022

The comment was uploaded in the form of a supplement:

<https://amt.copernicus.org/preprints/amt-2022-111/amt-2022-111-RC2-supplement.pdf>

Small scale variability of water vapor in
the atmosphere: implications for
inter-comparison of data from different
measuring systems

Xavier Calbert, Cintia Carbajal Henken, Sergo DeSouza-Machado, Bomin Sun, and Tony Reale

**** Many thanks for the positive remarks and the proposed changes which will improve the paper.**

This novel study presents a new methodology that demonstrates that the structure of water vapour concentrations at small scales (<6 km) can be approximated by Gaussian Random Fields (GRFs). The authors show that these GRFs have a spatial correlations with a structure function whose gradient is approximately 2/3, which is consistent with Kolmogorov's theory of turbulence. This new methodology is applied to numerical weather forecasting (NWP) fields and a range of real observation systems with different spatial and temporal sampling, with the results discussed in the context of one another. Finally, the results are related to their potential use in Nowcasting.

Overall, I find this study highly relevant to current research and applications within NWP and

Nowcasting. Therefore, I recommend this paper suitable for publication after the minor comments I have are addressed.

Specific Comments:

- page 2, line 2: reword the sentence "They measure over air regions of the order of linear measures of tens of kilometres." This doesn't read well, could change to something like: e.g. "These instruments measure air mass regions at scales of tens of kilometres."

**** Done**

- page 2, line 6: "mandatory" seems to be the wrong word, do you mean "necessary"?

**** Done**

- page 2, line 18: "below around 6 km", this doesn't read well and could replace around with ~.

**** Done**

- equation 10: does the vapour pressure "e" come in the radiosonde file or has it been calculated? If calculated, what vapour pressure formula was used? Is it consistent with what is used by GRUAN (Hyland and Wexler)? Please state this somewhere in the text.

**** Added comment and reference.**

- page 7, line 27-28: with the images you reference are they L1b files? the term "Level 1.5 ones" reads is a little non-specific. If the files are L1.5 are these fundamentally different to L1b? Therefore, maybe improve the description of the file contents are and put "(L1.5)" at the end of the sentence.

**** Done**

- page 8, lines 24-27: This section needs restructuring, is confusing to someone who is not familiar with NWC SAF workflow. Is the software package the only package NWC SAF produces? A clearer description here is needed.

**** Rephrased.**

- page 9, line 7: "a slot" is not an appropriate term here or clear to what is meant. Do you mean a clear sky region? please improve.

**** Corrected sentence**

- section 3.4: Is this ERA5? ERA Interim? or a specially run forecast at 0.125x0.125 deg run? Current IFS runs in ERA5 are available at 0.25x0.25, is this data just spatially interpolated? Please clarify and revise this section.

**** It is the operational model obtained at 0.125 x 0.125 degrees. Not ERA5 nor ERA Interim.**

Added operational in the sentence.

- Methods section: I think that this section could benefit from an algorithm flowchart to help the reader visualise the flow.

**** Agreed with the reviewer that it is not easy to follow the way to do the calculations. Unfortunately, the calculations involved are difficult to represent in a flowchart. The explanations seem to be adequate, so it is left as it is.**

- page 12, line 13: replace the phrase "To get a feeling" with something more appropriate, e.g. "To produce a representation"

**** Done**

- section 4.2.3: are all the OLCI regions cloud free? not clear from the text.
**** Tried to clarify this better in section 3.3 saying that cloudy pixels are shown as white and also in captions of figures 3, 5 and 6.**
- conclusions: Just needs a clear statement on the use or application to Nowcasting.
This is done well in the abstract but not so strong here.
**** Done**