

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2022-226

Anonymous Referee #1

Referee comment on "Accounting for meteorological biases in simulated plumes using smarter metrics" by Pierre J. Vanderbecken et al., Atmos. Meas. Tech. Discuss.,
<https://doi.org/10.5194/amt-2022-226-RC2>, 2022

The authors discuss how to compare satellite observations to simulated concentrations by limiting the weight of modelling errors due to the meteorology used to analyze the observations. The manuscript presents a lot of equations to describe the math behind the method. I'm not sure I fully understand all the details, particularly section 3. But the work generally looks sound to me. I recommend the following revision.

General comments:

- Our view is that meteorology drives the position error between the plume observed and the plume simulated by the CTM. This is the motivation of the work. However, I don't see how solid it is. There are several contributors to the errors. I don't see the reason why meteorology is the driver.
- I recommend the author to add a flow chart to demonstrate the method.

Specific comments:

- Line 7. It shall be analyze instead of analyse.
- The concept of pixel-wise norm has been proposed without giving any introduction. Same as double penalty issue, upstream correction, non-local matrix optimal transport theory. It will be difficult for readers without strong background for this very specific field to follow. I understand that it is difficult to give the definitions for all those items

in a short abstract. I would like to encourage the authors to reconsider the necessity of keeping all those items and the possibility of rephrasing the paragraph in a more reader-friendly way.

- Line 40-45. Meteorology is not the only contributor to modelled bias. Such information seems missing from the text.
- Line 51. What is "position error"?
- Line 47. "the relative weight of the meteorological uncertainties within the comparison between observation and simulation cannot be easily removed through pixel-wise comparison". I don't quite understand the meaning of this sentence. It sounds like the aim of the comparison performed at pixel level is removing meteorological uncertainties. Please try to rephrase it. Same for "This issue is shared in other fields". I'm not sure the sentence is clear to readers.
- Line 56. What is droplet or analogous decomposition? Please try to define before use.
- Line 58. What does "fields" represent here?
- Line 64. What is a moving field?