Simulated plumes freed from meteorological biases using smarter metrics? – response to Lok Lamsal, associate editor

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1 Answers to editor

1. *Dear Authors, Thank you for submitting your revision and responses to reviewer's comments. I have now read, with great interest, the original manuscript, reviewer's comments, and revised version of the manuscript. I find that the work is interesting and it should be of value to the AMT readership. Based on my own reading, I feel that the manuscript needs some work mostly clarifying some statements and describing figures in the figure caption. AMT might edit the manuscript, but it is important to ensure that the statements are clear and unambiguous. Please check the statements that I have listed below and improve them as necessary for clarity. I look forward to receiving your revisions soon. Best Regards, Lok*
→ All the authors would like to thank you for your dedication and the remarks you suggest to improve this article. You will find specific answers hereafter to all the remarks and suggestions you made.

2. *Title: Shouldn't it be "meteorological biases" instead of "meteorology biases"?*
→ You were right, we have made this change in the revised manuscript.

3. *Line 11: Please revise the statement: "To circumvent this issue, we propose to either..... both".*
→ We proposed a new formulation in the abstract (L. 10-12); we hope it is clearer.

4. *Line 21: Please revise the statement: "It is found that discrepancies between two plume images due to wind direction errors in the meteorological conditions are less penalised by our new metrics with the upstream correction than without, thus avoiding the double penalty issue."*

→ Indeed, the statement is quite long and hence confusing. We have modified the sentence (L. 17-20).

5. *I am aware that some people use "spectra-imagery", but this can be misleading. I believe the authors meant "satellite imagery".*
→ You are right, the term "satellite imagery" is better here. We have made the changes in the revised manuscript.

6. *Please define the acronym "CO2M"*
→ It is now done (L. 34).

7. *line 40: please revise the statement: "These fast methods require only the images to provide an estimation of the emissions, but, they do so, by assuming either simplified chemistry, transport or temporal variations of the emissions."*
→ This statement is not as clear as we intended. We proposed a revised statement (L. 37-38).

8. *line 54: please revise the statement: "This issue is shared in other fields .... comparisons"*
→ It should already be revised in the previous version of the manuscript. Perhaps the diff.tex we submitted did not take this specific change into account. Nevertheless, we have checked it twice and now this statement is revised.
   (L. 49-50).

9. *line 56: please revise the statement: "Assuming that the temporal .....inversion"*
→ This statement brings too much information at once. For the sake of clarity, we revised it (L. 50-53). We thank you for pointing this out.

10. *line 81: please revise the statement: "We will either consider isometry .... compared."*
→ We made some corrections in (L. 62-65). We hope that is clearer now.

11. *line 104: please revise the statement: "In the present article, we focus on two-dimensional images – typically of the total column of CO2 concentration, or of ground level concentration field –, full (no mask due to filtered data or clouds), with a discretisation of N pixels".*
→ Indeed, it is insufficiently clear and yet critical. We have split the sentence in the revised manuscript (L. 86-88).

12. *line 144: please revise the statement: "The idea is that, instead of considering the cost of the translation, the metric adds the cost to set to zero all pixels from the first Gaussian puff to the cost to enhance the pixels at the translated location."*

→ The description of the double penalty issue has been revised (L. 126-128). We hope that it is clearer now.

13. *line 149: please revise the statement - it looks incomplete sentence: "More practically, the difference between the sum of the compared image pixels."*
→ We have corrected the sentence (L. 132).

14. *line 176: please define the acronym: "L-BFGS"*
→ It is now done (L. 157).

15. *line 228: please revise the statement: "This shows that the Wasserstein distance w is a softer metric .... positions."*
→ Thank you for pointing this issue out. This statement should have been already revised in the previous manuscript. We hope this statement (L. 209-210) is clearer.

16. *line 254: I cannot see any equation with the division sign as mentioned here: "where ÷ is the entry-wise division in RN."*
→ Indeed, you were right, it was a writing mistake. It is now corrected.

17. *Page 13, Algorithm 1: I suggest to move this algorithm in the appendix section as I see it as a distraction.*
→ As you have suggested, it has been moved to the appendix.

18. *line 339: please define the acronym "POT".*
→ It is now done (L. 320).

19. *Figure 5: please expand the figure caption. It does not mention what the box, whisker, and red lines are representing. What are x- and y-axis and what are the units?*
→ Thank you for pointing this issue out. The caption is now revised. We hope it brings all the information required to understand it.

20. *line 386: please revise the statement and please pay attention to "between 50 km and km" in this sentence: "The horizontal grid resolution of the simulation domain (longitude: 6.82°W to 19.18°N; latitude: 42.0°N to 56.39°N, Fig. 6, Santaren et al., 2021) varies between 50km and km".*
→ Thank you for pointing out this mistake. The grid resolution goes from 50km down to 2km. The statement is now revised (L. 365).

21. *Figure 6: please expand the figure caption to describe all we can see in the figure. What do you mean by "Domain Santaren and al." mean?*
→ As you suggested, the caption is lacking some information. We have completed the caption.

22. *line 383: please revise the statement: "Consequently, the later in the day the plumes are emitted the shorter they are tracked."*
→ This part is critical since it provides a description of the plume database. We revised it (L. 376-380).

23. *line 394: please make sure that the reference is cited correctly. "Denier" sounds like the first name of the author.*
→ We have checked it. His full name is Hugo A. C. Denier van der Gon, Hugo being the first name and Denier van der Gon as the last name.

24. *line 399: please revise the statement for clarity: "We ensure that the same daily profile is applied to the source emission, then for a given hour of the day, the difference between two simulated plumes is the meteorological state".*
→ We made some modifications (L. 381-382). We hope it is clearer now.

25. *Figure 7: please expand the figure caption describing the box, whisker, and the colored line. Also please check what y- and x-axes are and what the units are.*
→ As it was done for Figure 5, we have expanded the caption.

26. *line 416: please revise the statement: "which is why we do not considered thereafter wnum in our comparisons".*
→ We have revised this statement (L. 399).

27. *line 418: You may have meant "as" in place of "than".*
→ Yes indeed, thank you for pointing this out.

28. *line 537: please revise the statement "For the case of the pixel-wise distance with an upstream correction, this can have an impact on the optimum". Optimum what?*
→ It was indeed unclear. We are talking about the optimal isometry used in d_F. We revised the statement (L. 519-520).

29. *line 545: "behaviour smoother". Did you mean "smoothing behavior"? Please revise the statement as necessary.*
→ It is obviously misleading; we meant that it penalises the position error linearly whereas the usual local metric grows fast and saturates at the end. We changed it (L. 526-527).