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Dear Editors,

Please find the reply to the reviewers regarding the last version of the manuscript “Data-Informed Inversion Model (DIIM): a framework to retrieve marine optical constituents in the BOUSSOLE site using a three-stream irradiance model ”, submitted for consideration as a regular Article (DOI: https://doi.org/10.5194/gmd-2024-174).

Yours sincerely,

Carlos Enmanuel Soto Lopez

Reply to Reviewer 1

Reviewer comment: *In this version of the manuscript the authors have addressed all the issues pointed out in my previous revision. The new version of the manuscript is better organized, and it provides more details of the methods employed, together with new schemas of the algorithms employed.*

Minor issues found:

- *L353 "observations corresponding to some of the wavelengths is missing" => are missing*
- *L441 "If the SGVB is used with a neural networks" => neural network, or remove the "a".*
- *L523 Suggestion: make Fig. 4, 5, 6 bigger, put the legends outside, and increase their font size.*
- *L605 "the estimated value from the MCMC could be bias for the noise" => could be biased?? due to the noise? The sentence is not clear.*

Author reply: We appreciate the time taken and all the comments made. In the new version of the Manuscript, we have made all the suggested changes, including the two typos in lines 353 and 441, and the changes to figure and label sizes from Figures 4, 5, and 6. Regarding the sentence in line 605, we changed it to "the estimated value from the MCMC could be affected by the noise".

Reply to Reviewer 2

Reviewer comment: *The authors provided very relevant and detailed answers to all (minor and major) comments and questions raised by Reviewer 1 and 2. The paper has been very substantially and carefully revised in addition to being enriched by new results and figures. In particular, Figure 1 is an original illustration of the different terms of the radiative transfer model (equation 1) which make the understanding the model equations more straightforward for non experts (I would just suggest to make sure that the fonts used in Figure 1 are large enough at final publishing stage). The Introduction has been modified to include the required clarifications, while the re-ordering of sections 2 and 3 makes the understanding of the model easier. The assumption of homogeneous upper layer with constant properties is clarified and justified. However, I am not completely sure yet that it can be extended to deep case 1 waters without dedicated care. I like the presentation of the 4 Algorithms in Section 4 which provide a very useful guide to users who will try to use and replicate the frameworks. The presentation of the results has been restructured in a way that it makes the interpretation of the results easier. The comparison with a state-of-the-art algorithm used within the Copernicus Marine Service across a broad region of the Northwestern Mediterranean is a convincing illustration of the performance of the methods. Hence, I definitely recommend publication of the revised paper after taking into account the minor comments here below.*

Minor issues found:

- *Check that the the equation terms in Figure 1 are large enough to ensure readability.*
- *L277: We → we.*
- *L361: Markov State → Markov Chain.*
- *Algorithm 3, Input: Lenghts of mcmc chaing → Lengths of MCMC chain.*
- *The use of mcmc vs. MCMC should be made homogeneous throughout the manuscript.*
- *Figure 11: since most points are concentrated in the small range of values, would it be more illustrative to plot a log transformed x-variable ?*

Author reply: We appreciate the time and extended overview of the original and new versions of the manuscript. In the last version of the manuscript, we modified the typos in lines 277, 361 and made the use of the MCMC nomenclature homogeneous. Lastly, regarding Figure 11, we left it as it was since we consider that a linear transform serves as a good representation to show the linear correlation between the two variables.