

Reviewer 1

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.

Reviewer 2

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 comments:

- Check that the equation terms in Figure 1 are large enough to ensure readability.
- L277: We -> we
- L361: Markov State -> Markov Chain
- Algorithm 3, Input: Lengths of mcmc chain
- 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?