Dear Editor,

Below we have listed the comments from the reviewer, followed by our responses in italics. We would like to thank the editor for the handling of our manuscript, and the reviewers for their comments which have helped to improve the manuscript.

Anonymous Referee #2

- L403: Without reading through the referenced literature, I'm somewhat confused about the sentence "This produces vertical speeds which are multiple times too large compared to the observational estimates as calculated from the tape recorder lag correlation from reanalysis and satellite observations." Is it meant, that the residual circulation estimate using the standard definition of w* in reanalysis is too fast due to assimilation? Isn't the standard definition of w* the benchmark to which other estimates should be compared to, irrespective of the value it has? Maybe I'm misunderstanding something here, but I suggest to think about the paragraph again and perhaps reformulate.
    - *We thank the reviewer for pointing out the confusion that is created by the wording used here. The paragraph has been edited to be more clear, and the section of interest now reads: "It has been demonstrated that there is an incoherence between the water vapour tape recorder and vertical residual velocity in reanalysis, likely due to enhanced vertical dispersion of water vapour due to data assimilation (Glanville and Birner, 2017; Linz et al., 2019). This produces an effective vertical speed of the reanalysis tape recorder which is multiple times too large compared to the observational estimates as calculated from the tape recorder lag correlation from satellite observations."*
- L523: Regarding the sentence "The good agreement found here further demonstrates the robustness of these methods for estimating tropical upwelling...": The good agreement could also be caused by the effect of mixing impacting both estimates similarly. Perhaps worth mentioning.
    - *Good point. We added the sentence, "The good agreement does not exclude the possibility that both methods are impacted by the effects of mixing.", to speak to the possible effect of mixing.*
- Fig. 11 / caption: the labels (6) and (12) should be explained also in the caption.
    - *We thank the reviewer for the suggestion; this change has been made.*
- L574: Given the lack of a proper proof-of-concept for the upwelling estimate (see my previous review comments), I find the sentence "These results reaffirm confidence in the reanalysis upwelling estimates." in the conclusions somewhat too strong. I'd suggest mentioning also potential methodological uncertainties here in that context, but I leave that decision to the authors and the editor.
    - *We thank the reviewer for this suggestion .This sentence has been expanded to add a caveat that the methodological uncertainties in our method do not allow for a direct quantitative comparison. The edited sentence reads: "These results reaffirm confidence in the reanalysis upwelling estimates, with the caveat that*

methodological uncertainties exist in our estimated upwelling as discussed in Sects. 2.3 and 3.3 potentially hindering an accurate direct quantitative comparison as exemplified by the differences in upwelling strength shown in the seasonal cycles of Figs. 8 and 9."