Review of egusphere-2025-379
Extension of AVHRR-based climate data records: Exploring ways to simulate AVHRR radiances from Suomi-NPP VIIRS data

By: Karl-Göran Karlsson, Nina Håkansson, Salomon Eliasson, Erwin Wolters, Ronald Scheirer

Comments from Reviewer 1 and the Editor

Comments from Reviewer 1:

Overall Recommendation

The authors did an excellent job in revising version 1 of their paper, they clearly replied to all my points of criticism and modified the manuscript accordingly. The revised version improved a lot, both in terms of information content and clarity, as well as in the presentation of the information.

Author response: Thank you very much!

I have found a few minor points of concern, which I mention below. Apart from these points, the manuscript is suitable for publication as far as I am concerned.

Minor Criticisms

Table 7, 8, 9: The authors give a very extensive reply to my question on the differences seen in validation results of the CFC results for COT>0.0 and COT >0.2 and the CTH results for COT >0.0 and COT>0.4. The basic message of my comment was: Why do the authors keep in the results of the COT>0.0, and not only present the CFC results for COT>0.2 and CTH results for COT>0.4?

I am happy with the reply of the authors, and it is fine to keep both. However, the differences between the results of COT>0.0 and COT>0.2 or 0.4 may raise many questions among readers. Thus, some additional explanation in the text would be helpful, can the authors add the main message of their reply, in a condensed form, as explanatory text to the results of Table 7, 8, 9?

Author response: *We can certainly do that. We suggest to rewrite the entire paragraph before Table 6 (notice that one table was removed in the updated manuscript, thus validation result tables are now Tables 6, 7 and 8) as follows (starting at line 438):*

"The tables also show the original requirements for the three cloud products in the CLARA-A3 CDR in the rightmost columns. Products generated from VIIRS/VGAC-simulated data should also fulfill these requirements. In the CLARA-A3 evaluation, very thin clouds detected by CALIPSO-CALIOP were removed based on COT thresholds of 0.2 and 0.4 for CFC and CTH, respectively. Karlsson and Håkansson (2018) suggested this CFC COT threshold after studying the effect of COT thresholding during the CLARA-A2 CDR CFC validation exercise. They found the best overall validation scores when excluding clouds with COT lower than this threshold. This COT-thresholding was later used to define the CLARA-A3 CFC requirement (Table 6, rightmost column). Here, using different CFC and COT thresholds (Tables 6 and 7) is motivated by wanting to discard the thinnest clouds when validating the CTH product. These clouds are always the most difficult to deal with for any CTH retrieval, i.e., the thinner the clouds, the more challenging it becomes to compensate for semi-transparency effects. The

COT threshold for CTH validation is more arbitrarily chosen. It should be higher than 0.2, although not drastically, since cloud detection efficiency increases rapidly for COTs larger than 0.2 (see Karlsson and Håkansson, 2018). A reasonable threshold of 0.4 was found to remove some of these thin cloud uncertainties. The threshold should not be too high to give justice to all semi-transparency correction efforts, i.e., it would not make sense to only look at opaque clouds. To highlight improvements more clearly, Tables 6 and 7 show both the COT-thresholded results, used for CLARA-A3 requirements, and the original results that include optically thin clouds. Relying only on the COT-thresholded results would overlook important improvements to the overall CDR, particularly for the CFC product."

Just to comment a bit more what this COT-thresholding brings to the results: For CFC it really means that most of the differences caused by the higher sensitivity to thin clouds for CALIOP disappear (i.e., the bias is reduced to almost zero %, thus well within the requirements of 5 %). For CTH, the effect is less obvious (i.e., requirements are hardly met) but this is mostly explained by the problems of using the mean error score as the basis for the requirement. It should rather have been the mean absolute error. This is clearly mentioned in the text so no further changes are needed.

Table 6: A % sign is missing

Author response: *Corrected (Column 4, Row 5 in Table 6).*

Table B1: The updates made to the tables in Appendix B are great, they make the picture complete. I noticed that the text of caption does not yet match with the updated content of the table (eg it mentions RMSE and does not mention CORRELATION). Please check and adjust"

Author response: *Indeed, we missed this aspect. Now corrected in the captions to Tables B1-B4.*

Comments from Editor:

"Checking your paper, I noticed that your Table 2 contains coloured text. Please note that this will not be possible in the final revised version of the paper due to HTML conversion of the paper. When revising the final version, you can use footnotes or italic/bold font."

Author reply: *This is now corrected. We have used bold fonts as replacement for the colour.*

Additional changes:

Author response: *There are a few typos corrected and some small editorial changes made in the manuscript (visible in the tracked changes version of the document).*