

Dear reviewer,

We'd like to thank you for the insight you provided on our paper. Your suggestions have been included, and the revisions document shows all changes.

Specific Comments:

The conclusions lack a summary of the quantitative results of the paper and also lack a recommendation about the types of clouds that this technique should be applied to by a potential user.

The conclusion has been amended to include a discussion of our results and recommendations.

The results presented on accuracy by extent/altitude should be combined with studies from the literature on cloud types and their sizes (e.g., Wood & Field, 2011) to come to such a recommendation.

The suggested citation has been included, and we mention that it agrees with our findings.

Figure 8: Is there a joint dependence of the dice score on the Top-of-cloud-distance/Cumulative Depth on the total thickness of the cloud object (highest-top to lowest base)? In other words, is there a difference between the accuracy at the top of a thick cloud and the top of a thin cloud? Alternatively, is there a difference between the top of a high-topped cloud and the top of a low-topped cloud?

We slightly clarified the wording in the text (line 427). Results at top of cloud are generally good across our experiments, although the model performs worse with quite thin clouds, which can be seen in the qualitative results. The altitude figures already illustrate the model's skill at high-topped vs low-topped. We choose not to add more figures relating cloud thickness to top-of-cloud distance and cumulative depth (as well as the correlations between all these variables) as the existing relationship is already quite complex, and because we believe Figures 7-8 are a better representation the model's performance for different cloud types/regions.

Line 13: The abstract says "we draw conclusions" but doesn't state the conclusions. The abstract is most helpful when it summarizes these conclusions. I would recommend trying to trim words from the first half of the abstract and adding some more quantitative results to the abstract.

Good point. The abstract has been significantly changed to take this advice into account.

Technical Comments:

Line 21: References for the feedback cycles should be added here.

Added a citation for feedbacks, but also note that the citations already here relate to *both* cloud feedbacks and climate sensitivity models, which is why they're listed at the end.

Line 27: Three satellite missions. There should be a transition sentence introducing satellite remote sensing as a means of acquiring semi-global observations to reduce these uncertainties.

Fixed.

Line 49: Some references to instruments like MISR/ATSR here would be good.

MISR and ATSR are both already referenced, here or in the next paragraph.

Line 60: I suggest changing this to something along the lines of "This work is the first to utilize POLDER measurements for the estimation of full vertical cloud profiles." So that readers also learn about what you are doing at the same time as you mention its novelty. This is important as the introduction currently lacks a clear "we are going to do X" statement.

Good point, done!

Line 62: The way the pinhole vs rational polynomial comparison is made in the text makes it seem like this is an algorithmic choice, rather than something that I would believe would originate from differences in optical hardware.

This has been clarified.

Line 332: I suggest adding "To evaluate the predictions of the models we use the Dice score." Or something to this effect at the beginning of Section 4.1.

Fixed.

Line 341: Here I suggest simply stating: we report the dice scores in %. Line 358-359: Dice scores need percentage symbol.

Fixed.

Table 3/Section 4.4. which model architecture is used to produce these results? This should be in the caption of Table 3 and Figure 4.

Fixed.

Figure 9: I believe the color label should show something like “cloud length” rather than “color scale (km)”. The color map for the clouds should be switched to something that doesn’t end in black (e.g. red, yellow, blue) so that all the clouds can still be seen regardless of whether they are small.

Good point about the color map, it’s been fixed now. We left the “color scale” label because the plot title already reads “Cloud Horizontal Extent”. Adding it again would be redundant and calling it “cloud length” might mislead readers into thinking those are different things.