

Refereer1 comments:

1-7. These are minor modifications.

Answer: Corrected as requested.

8. Line 241, 'hidden layer size' can be confusing for readers whether that is the number of hidden layers, or the number of neurons on each hidden layer. Personally I would believe the number 3 refers to the number of hidden layers. But the saying on Line 238 which reads as 'having a hidden layer that is too large' also seems to indicate the latter meaning. Please explain in a clear way.

Answer: Following the suggestion of referee2, LSTM is replaced with random forest. Random forest does not have the hyperparameter 'hidden layers'.

9. Line 251~252, are both models A and B using the same settings of batch size, optimizer and loss function? As far as I know, classification models (model A) and regression models (model B) usually use different loss functions.

Answer: As per Comment 8, LSTM has been swapped with random forest.

10-15. Substitution of words and modification of the title in Figure 2 (b).

Answer: Corrected as requested.

16. Table 4, what truth value are the statistics calculated against? According to Line 190~191 in this manuscript, 2B-CLDCLASS-LIDAR data is only available before July 2019.

Answer: Table 4 presents the statistical truth of 2B-CLDCLASS-LIDAR data for June and July. 2B-CLDCLASS-LIDAR data is available until August 2019. This error has been rectified.

Line 216.

Refereer2 comments:

Why do you only use data from May and June 2019? FY-4A was launched earlier, so shouldn't there be more data available? It would be good to take a random sample from a larger window of time with more seasonal variability. If there is some other reason only to use this time window, it needs to be stated here.

Answer: The latitude range for a single observation of FY-4A AGRI is -83.3~83.3. This latitude range includes data from different seasons, climates, and surface types. In the training samples matched temporally and spatially with 2B-CLDCLASS-LIDAR, seasons and climates vary with latitude. Therefore, it is not necessary to include data from a larger time range as training samples.

Line 215-220.

Figure 2:

(a) circular lines should be thicker, text should be larger

(b) missing a legend for the colors

(c) put the degree sign ° on the tick labels in the color bar

(d) missing a legend for the colors, and you should use different marker types (e.g. triangles and circles) to help colorblind readers

Answer: The figure has been redrawn as requested.

Line 381-382

You use a temporal / recurrent network architecture (LSTM) but have no description of how the temporal aspect of your data is used by the network. You need to describe this, in detail. What are the timesteps? Is there a warmup time for your LSTM (a minimum time before it attains a stable state and a reasonable accuracy)? On the other hand, if there is no time series information in use here, you should not be using an LSTM! Having a reasonable standard baseline (like a regular neural network or a random forest) would further help contextualize your results.

Answer: There was no use of time series information in this paper. Following the suggestion, LSTM has been replaced with Random Forest.

You are comparing your network with an operational cloud product. This is not a very fair comparison, as the operational cloud product is designed with different goals and principles (and physics) in mind than 2B-CLDCLASS-LIDAR was, whereas your method is directly trained on the 2B-CLDCLASS-LIDAR product. You should spend more time breaking down these differences.

Answer: Additional algorithms for the 2B-CLDCLASS-LIDAR product were provided (line 158-176), along with an analysis of its differences from operational products. The 2B-CLDCLASS-LIDAR product, derived from the active remote sensing instrument CPR-CALIOP, is currently the most accurate cloud fraction product. When evaluating the accuracy of cloud retrieval algorithms against operational products, using 2B-CLDCLASS-LIDAR as the reference value is the only choice.

All other comments are about LSTM.

Refereer3 comments:

The manuscript primarily discusses the method, but the abstract and the content focuses only on the results. There is insufficient explanation about the method (machine learning and correction), its characteristics, and why it leads to improvements.

Answer: LSTM has been replaced by Random Forest, and the basic concepts, hyperparameter selection, and the reasons for its suitability for this study have been added (line 230-267). Machine learning algorithms are not the reason for improvement in results. The main factors leading to improved results are the selection of true values, the presence of strong relationships between inputs and outputs, that is, the accuracy of the training set. If the training set is sufficiently accurate, regardless of the machine learning algorithm used, the results will be similar.

The manuscript lacks a discussion about the impact of different machine learning structures on the

retrieval of cloud fraction. Please provide more results regarding this.

Answer: The manuscript title has been changed to "Retrieval of cloud fraction using random forest based on FY4A AGRI observations." No need to discuss the impact of different algorithms on the results.

The data resolution of CloudSat and CALIPSO is not consistent with AGRI. It is crucial to discuss this dataset uncertainty and its impact on the retrieval.

Answer: Indeed, the resolutions of CloudSat & CALIPSO are different from that of AGRI. Therefore, spatial matching is necessary when creating the training dataset, with specific details in lines 188 to 193.

The captions of the figures and tables are too simplified and do not provide essential information.

Answer: The titles of the figures and tables have been changed.

Line 63: What is the spatial resolution of the instrument?

Answer: 4km. The relevant information has been added in the respective locations. Line 98.

Lines 65-81: Summarize these old and classic references, emphasizing only the important ones.

Answer: A summary of these references has been made. Line 63-68.

Lines 98-113: The logic is not clear. Why did the authors conduct this work, and what is the advantage of the LSTM compared to other frameworks?

Answer: The logic has been clarified and this section has been rewritten. Line 96-115.

Table 1: A reference should be provided.

Answer: This table is from <https://www.nsmc.org.cn/nsmc/cn/instrument/AGRI.html>. Line 134.

Lines 149-155: Since cloud fraction is important for building the training dataset, the algorithm for the joint product should be introduced. Additionally, how the uncertainty in the dataset affects the retrieval should also be discussed.

Answer: The algorithm for the joint products is detailed. Line 158-176.

Lines 253-258: When discussing LSTM, the use of time series information is implied. Is this the case in your study?

Answer: No time series information has been used.

Line 81, it should be made clear that why "season" and "climate" will influence the thresholds?

Answer: Line 70-79. The reason has been added.

All minor corrections have been rectified.