

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-422

Antti Lipponen (Referee)

Referee comment on "Improving discrimination between clouds and optically thick aerosol plumes in geostationary satellite data" by Daniel Robbins et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-422-RC1>, 2022

General comments:

Cloud masking is an essential part of satellite aerosol retrievals and other satellite applications. Robbins et al. describe and evaluate a neural network-based cloud screening algorithm for the Himawari-8 AHI instrument. The method developed specifically focuses on minimizing the misidentification of thick aerosol as a cloud that often causes problems in cloud masking techniques. I believe this type of algorithm development work is exciting and valuable for the readers of AMT.

The algorithm development presented in Robbins et al. is based on training neural networks for cloud detection. The development work has been designed very well and considers all important details. In supervised learning, such as neural networks, the training and validation data quality is important. In this work, the authors have paid careful attention to creating high-quality training and validation datasets based on careful collocation of the CALIPSO lidar and Himawari-8 AHI data. The manuscript is clear and very well written. The abstract provides a complete summary of the work carried out, and the conclusions are supported by the results shown in the manuscript. The results are carefully analyzed and shown.

In addition to conventional comparison of the results between different cloud masks, the authors have also used the SHAP analysis to carefully explain the neural network outputs and find the most important input features. SHAP analysis is a good idea and reveals the main reasons for the neural networks' improved performance over the conventional cloud masking algorithms. This analysis presented in the manuscript is also highly valuable information for the cloud masking algorithm developers.

Open sharing of the codes and models and the CALIPSO-Himawari-8 collocated cloud data even further increases the credibility of this model development work and will greatly

benefit other algorithm developers.

Specific comments:

I.152 The final inputs to the neural networks are listed. Line 91, however, states: "The auxiliary information from AHI is also included in the collocated data, such as the latitudes, longitudes, solar and observation angles." Are the latitudes and longitudes included as inputs for the neural networks?

I.172 The neural network training section lacks some minor details for reproducing the results. For example, how many epochs were used to train the neural networks? Was there an early stopping criterion to stop the optimization? How do the authors ensure the convergence of the trained neural networks?

I.227 Please describe what is meant by a collocated dataset ("30 collocated datasets"). For example, do a single dataset correspond to some specific time instant, or are the pixels selected randomly, or something else?

I.252 Please clarify that by the surface type you mean land or ocean.

I.267 Typo "Shapely". It should be "Shapley".