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Discussions

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Interactive comment on "Top-of-the-atmosphere shortwave flux estimation from UV satellite observations: An empirical approach using data from the A-train constellation" *by* Pawan Gupta et al.

Anonymous Referee #2

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General comments:

This manuscript deals with a novel method to estimate TOA (top of atmosphere) short wave fluxes based on measurements (or model output) of different atmospheric parameters in combination with a neural network (NN) approach. The NN is trained with short wave flux measurements with the CERES instrument on the Aqua satellite. The method, particularly the refined method works remarkably well, making this manuscript interesting for the atmospheric science community. The paper is in general well written and easy to follow – apart from the sentences listed below. I have no major objec-

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Discussion paper

tions to the publication of this manuscript and recommend accepting it subject to minor revisions.

Apart from the specific comments listed below I recommend adding some general comments to the manuscript on the strength (e.g., computational speed) and weaknesses of NN approaches. NN methods can certainly not replace dedicated measurements of the TOA SW flux. My concern with NNs is always that they may not be able to work properly under for unusual conditions that never occurred in the training data set.

Specific comments:

Page 1, line 20: "cloud/aerosols parameters" -> "cloud/aerosol parameters"

Page 6, line 25: "C1 water droplets"

Please explain what you mean by "C1 water droplets"

Page 6, line 26: "Heneye-Greenstein" -> "Henyey-Greenstein"

Caption Figure 1: "Heneye-Greenstein" -> "Henyey-Greenstein"

Figure 2: I don't fully understand this Figure, to be honest. I do understand the quantities plotted, but I'm not sure what the color legend refers to. The values range from 0 to 0.5? Is this a normalized distribution? Also, the Figure seems to show two different things, i.e. the small dots – that probably refer to individual measurements – and then the colored squares. Please explain in more detail what this Figure shows.

Page 7, line 28: "We examine the frequency distribution of the distance between OMI and CERES pixels of all the collocated data sets and found that most of the collocated data (98% and 60%) have distances less than 20km and 10km, respectively."

I don't quite understand this statement – 98% of the collocated pixels have distances of less than 20 km. This statement can only by interpreted properly if the collocation criterion is also provided.

Page 8, line 7: "Although the NN training includes data from CERES and other ancillary data sets but the trained NN provides TOA SWF similar to CERES using predominantly retrievals from OMI measurements."

Please check logic of this sentence

Page 9, line 11: Please spell out "NNM" – it took me a bit to understand what this acronym means.

Figure 4: The color bar at the bottom of the Figure overlaps with the bottom panels.

Figure 5: Similar comment as for Fig. 2 above. Please explain in more detail what this Figure displays.

Page 10, line 28: "The color of each coincident pair (10x10 Wm-2 intervals) represents the density (%) of the matchup."

I'm sorry, but I'm not able to follow this statement. What do you mean by "density (%) of the matchup"?

Page 11, line 1: "In this case, results were degraded as compared with application to January data."

It's not clear to me what this statement exactly means. Please explain.

Page 11, lines 2 – 6: I read these sentences several times, but this paragraph doesn't really make sense to me. I think some pieces of information are missing that are needed to follow the logic of the arguments. Perhaps I'm missing a point.

Figure 6: The top panel shows training results, and the bottom panel validation results, OK. But the Figure caption says that 2 models are used here? If this is the case, shouldn't there be more, i.e. 4, panels – training results for each model and validation results for each of the two models?

Page 12, line 13: remove parentheses around Joiner reference.

Page 14, section 4.4: It's not clear which NNM was used for the results over land surfaces. Please discuss.

Figures 8, 9, 10, 11, 12: I suggest mentioning explicitly in the Figure caption – and also in the text – which of the models listed in Table 1 was used to produce the results. This is not really clear, at least to me.

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