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Interactive comment on "Satellite retrieval of aerosol microphysical and optical parameters using neural networks: a new methodology applied to the Sahara desert dust peak" *by* M. Taylor et al.

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As a co-author of the paper I have written some comments concerning the paper that has not been implemented in this AMTD document by mistake and my opinion is that have to be implemented at least in this revision phase.

1. Page 10956, lines 24-26, "The network. . . daily timescale": The data that fall in the acceptable uncertainty (39-45%) refer to the dataset used for the NN testing, which is far from broad to be able to deduce such a general remark. Replace with: "Unfortu-

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nately, the NN failed to retrieve the real part of the complex refractive index."

2. Page 10967, lines 9-14, "While we are conscious. . . presented here": Due to the mixing of the original variables, it is better not to refer to "(non-)physical combinations" for the calculated principal components (see also: Aires, F., W.B. Rossow and A. Chédin (2002), Rotation of EOFs by the Independent Component Analysis: Toward a Solution of the Mixing Problem in the Decomposition of Geophysical Time Series, J. Atmos. Sci., 59, 111–123.) Replace with: The components calculated from PCA are a mixture of the original variables. We also did some trials applying PCA on groups of variables of the same type (e.g. AVSD bins and spectral parameters separately) but the results were worse than those presented here. For the same reason, in page 10983, lines 26-27, replace "Furthermore, PCA was used to extract "meaningful" components. . ." with "Furthermore, PCA was used to extract principal components. . ."

3. Page 10972, lines 20-24, "In Table 3. . . the AERONET AAOD at 440 nm" Page 10974, lines 2-8, "Finally,. . . on the scale of radial bins.": The "mean value of all correlations <AVSD>" is obviously not calculated right. For example, for the NN of CASE 4 <AVSD>=0.944, whereas as shown in Figure 5a the maximum correlation is ≈0.47 (for bin 6). Moreover, considering the different trends in fine and coarse modes shown in Figure 5a, it would be more meaningful to provide one <AVSD> for fine and one for coarse mode. For the same reason, page 10978, lines 8-29 and page 10979, lines 1-15 and Figure 7 should be checked again.

4. Page 10973, lines 9-14, "As described in Appendix A, . . . that depend sensitively on it": I don't believe that the location of the mode separation point plays that big of a role. If that is the case though, you could include the geometric radius in the NN retrieval, so you don't have to calculate it from the retrieved volume size distribution. Also, the better performance of CASE 4 NN has most probably to do with the better retrieval of the refractive index, due to the absorption information provided in the inputs from the AAOD at 550nm.

5. Page 10975, lines 8-10, "There appears... all optical parameters": I don't think this is a valid conclusion considering the training performance. It varies too much with the case to be able to say.

6. Page 10976, lines 23-28 and Page 10977, lines 1-5, "This is explainable... systematically lower than AERONET values (Remer et al., 2005)": The way the different instruments measure do not provide any explanation about the systematically lower AOD of MODIS and OMI compared to the AERONET AOD.

7. Page 10981, lines 21-23, "For all of the other parameters... at Dakar": Exactly because the sample is small (and probably a subset of the training dataset), the NN testing performance can be better than testing it with a broader range of cases. Replace as: "For all of the other parameters at least 60% of the retrieved daily-averages are within the accepted level of difference, which is a satisfactory result."

8. Page 10982, lines 13-15, "This error... (Dubovik and King, 2000)" Delete this, since the two errors are not really comparable (the error reported from AERONET denotes the difference from the "true" value, whereas the NN error denotes the difference from the AERONET value).

9. Page 10984, line 3, "With regard to testing the ability of the NNs to extrapolate to unseen data at Dakar...": There is no proof provided that the dataset from Dakar is out of the range of the training dataset. If it is a subset of the training dataset, there is not "extrapolation". Just to be on the safe side, the above should be written as: "With regard to testing the ability of the NNs to perform to unseen data at Dakar...":

10. Page 10984, lines 6-8, "Having said this, ... a near-zero mean error." Replace with "Having said this, the histogram of the differences between NN PC outputs and PC targets at the training stage was found to present a sharply-peaked Gaussian having a near-zero mean error."

11. Page 10984, lines 12, "...with known a priori AERONET data..." Write instead "...

with AERONET data. . ."

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