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Interactive comment on “Aerosol optical depth retrievals at the Izaña Atmospheric Observatory from 1941 to 2013 by using artificial neural networks” by R. D. García et al.

Anonymous Referee #1

Received and published: 6 October 2015

This manuscript by Garcia et al., "Aerosol optical depth retrievals at the Izaña Atmospheric Observatory from 1941 to 2013 by using artificial neural networks", presents a reconstruction of aerosol optical depth for 73 year time period. There are not very many long-term time series available for aerosol optical depth and, therefore, the topic of this study is of great interest and importance. The scope of the paper is both concise and specific, and my minor comments are mainly related to the need to clarify some of the issues. Before publication, the following points should be addressed:

GENERAL COMMENTS:

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I was missing some more information and details in the section 3. For instance, the very meaning of Eq 1. did not become clear, without any other explanations. Could you open the procedure and algorithm somewhat more. Also, in the section 3.1, it did not become clear what is the difference between 15% for validation and 15% for testing, both being independent from training, naturally. So more background about the algorithm would be welcome.

The idea to use FCS should have been discussed in more depth as well. For what effect, related to AOD, FCS is accounting for? Is it cloud contamination in AOD, as I was thinking. However, in that case, would it have been perhaps more justified approach to use FCS to exclude cases of presence of clouds and train the algorithm for those cases? Would there be some illustrative cases to demonstrate the role of FCS during the training period? At least, please provide more discussion about the role of FCS.

SPECIFIC COMMENTS:

Page 9077, lines 5-10, here I was thinking that perhaps Lachat and Wehrli 2013 could be cited here, since they analyzed a very nice and long time series for dimming and brightening trends.

Page 9077, line 11-12, I can understand the meaning, however somehow the sentence is not complete. Should it continue, e.g. "... have significant role."

Page 9083, line 2, "fraction clear sky", should it be "fraction of clear sky"?

Page 9083, line 3, should the ratio be other way around? Ratio between measured and SDmax?

Page 9083, line 10, "range from 1916 and 1921", the latter number is wrong? Otherwise the meteorological data are only for a very limited period.

Last paragraph of the section 4 remained somewhat unclear. Could you please provide some more details about the analysis to detect change points and so on.

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Table 1: HR should be likely RH?

Lachat, D., and C. Wehrli (2013), Dimming and brightening trends in direct solar irradiance from 1909 to 2010 over Davos, Switzerland: Proportions of aerosol and gaseous transmission, *J. Geophys. Res. Atmos.*, 118, 3285–3291, doi:10.1002/jgrd.50344.

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