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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effect of water vapour on the determination of Aerosol Direct Radiative Effect based on the AERONET fluxes" *by* J. Huttunen et al.

Anonymous Referee #1

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This is a very interesting work bringing to the light issues that affect directly the results of various studies related with aerosol direct radiative effects. The authors use AERONET related data and methods in order to show that Fzero extrapolation and ADRE calculations are not so trivial, presenting the effects of WVC in such calculations.

Main comments

My main concern for this sensitivity study of calculations of ADRE is the fact that all modeling work of the study is not described in detail since it is AERONET based.

There, a number of assumptions about spectral dependence of aerosol extinction, absorption, profiles, extraterrestrial spectrum used e.t.c. that are not described and more or less are assumed that include no uncertainties (investigating some systematic ones here) on the AERONET Fzero calculations.

In addition to the previous comment, since the paper discusses absolute solar radiation differences, the absolute uncertainties of AOD, SSA, WVC AERONET retrievals should be discussed in such a study. As an example: AERONET radiative transfer model utilize a certain extraterrestrial spectrum (ET) for calculating solar radiation, individual wavelength direct sun Langley calibration include an uncertainty translated in AOD (or AO Thickness to be more precise) uncertainty. So in theory CIMEL Langley air mass zero values at one wavelength should represent the (spectral weighted due to non monochromatic direct sun measurement) ET at the same wavelength.

It would be an interesting exercise to use a radiative transfer model in order to calculate ADRE's at a shorter (limited, e.g. PAR) wavelength range (excluding wavelength ranges with high WVC effects), in order to see if there can be a closure on the (even limited in wavelength range) ADRE approaches. In addition, the dependence of WVC and AOD as described is a complex issue. In a part of the document there is a short discussion on seasonal characteristics of AOD and WVC (that look like an interdependence, but still it is not a direct one) that needs more elaboration.

Figure 2 is kind of misleading as currently it contains 5 figures (four are mentioned in the caption and the text) and also with different axis limits, making the visual comparison of the datasets difficult.

The solar zenith angle correction mentioned at p 754 line 27 has to be clarified

P 752 line 13 WVC acronym was not defined

P 756 line 10. The reason of not using all available pyranometers is explained. However I would suggest to add at least one station (e.g. figure 1 station) pyranometer data in

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the analysis, since they are the “real” measurement for solar radiation. And can point also to one direction towards linear and non linear results.

In general, the paper brings up a very interesting issue, provides a possible explanation for it, and also leaves some open question for future research. What I am missing in the conclusions is a suggestion from the authors, on possible users of such data, in order to use them for ADRE calculations. My opinion is that it is a very interested idea/manuscript and I suggest it’s publication including the above more or less minor comments/recommendations.

I apologize for the delay in the review.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 751, 2014.