**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "AERONET and ESR sun direct products comparison performed on Cimel CE318 and Prede POM01 solar radiometers" *by* V. Estellés et al.

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REVIEWER COMMENT: We at AERONET are very gratified to see the comparison between our current Version 2 AOD results and those with the ESR processing system. However there are several misstatements and/or misrepresentations that should be pointed out and corrected for the record.

AUTHOR RESPONSE: We are very pleased to receive your feedback about our comparison with AERONET. Although we have tried to take into account your comments from previous discussions, we realize that some paragraphs could be improved or corrected to avoid misunderstandings in the science community. We hope you will agree

with the final reviewed version of the article.

REVIEWER COMMENT: On page 4343 the authors correctly point out the need for climate data records be based on standardization. The following paragraph cites AERONET as an example of standardization but emphasizes the algorithm is not publically available implying that the global CDR record is less complete with the closed AERONET system. QA and CDR's imply traceability. In an open source system in which the algorithm changes the final result i.e. CDR, QA'd AOD etc., traceability quickly disappears and one's confidence in the product can and is diminished. This becomes very difficult to reconcile for publications when results must be reproducible. In an open source algorithm, changeable databases are the norm and confound the scientific process. I thus recommend that the paragraph referencing CDR's be removed and that the paper acknowledges that ESR is a research and development network different from traceable data produced by AERONET.

AUTHOR RESPONSE: In this paragraph we intended to emphasize that many Cimel sites do not use a normalized code because they are out of AERONET programme. By the application of our algorithm, more visibility and some degree of homogeneity can be reached, although these datasets are not used for final QA CDR.

However, to avoid misunderstandings we have removed the last part of this paragraph as recommended. The acknowledgment of the status of the ESR network has been included in the correspondent paragraph in page 4344 ("The European Skynet Radiometers network. . .").

REVIEWER COMMENT: Having said that we applaud the use of open source code to develop new and improved algorithms as a research tool. I wish to note that the AERONET algorithms are closed is a misrepresentation. All of our algorithms are either published and/or available on the AERONET Website http://aeronet.gsfc.nasa.gov/new_web/publications.html. As has been stated since the Holben (1998) paper that the AERONET team uses verifiable and published and com-

munity accepted algorithms in the AERONET processing code, thus AERONET has worked with all willing investigators to develop the best verifiable up to date processing code possible for the parameters of operating a traceable network. Due to the tremendous complexity of interfacing an algorithm with the various inputs from NCEP, satellite databases and incoming data flows the processing development remains within and under the control of the AERONET system. An example is the frequently used SDA processing developed by Prof. Norm O'Neill at Sherbrook University. Currently our version 3 processing that is under development is engaging members of the satellite community to provide new correction climatologies, the lidar community for cloud screening and members or the Goddard AERONET and PHOTONS staff for polarization algorithms and calibration procedures.

AUTHOR RESPONSE: We completely agree that the AERONET algorithms are published and are based on verified techniques. As we did not intend to give a contrary impression, we have removed the statements noting that the AERONET algorithms are closed from the reviewed version of the article.

REVIEWER COMMENT: I wish to correct the record, there are over 450 instruments registered in AERONET distributed over all continents. The paper implies that it is primarily a North American and European network. Indeed most of the instruments are not in North America and Europe.

AUTHOR RESPONSE: We thank you for this correction. The updated number of sites will be used in the text, and the implication about United States and Europe removed.

REVIEWER COMMENT: I note that this paper only deals with AOD that is based on a direct measurement and thus is not a retrieval as frequently misstated throughout the document. The paper notes that AERONET adopts the original Dubovik & King (2000) code. This is the inversion code and has nothing to do with the AOD computations. Lastly the Dubovik code, as a standalone, is available from Dubovik at LOA.

AUTHOR RESPONSE: Actually the statements about AOD retrieval (and not mea-

surements) were added in a later version of the manuscript after a discussion with an anonymous reviewer from a previous article. We thank you for this correction and for providing a citable comment for eventual further discussions. We will correct the term in the reviewed text.

We cited Dubovik & King code only during the general introduction of AERONET, stating that the code "analyze the radiation components" (page 4343). But we did not intend to say that the Dubovik code is used for the retrieval of the AOD. In page 4344 line 25 we said that "in mode 2 we have implemented other routines that are much closer to those of AERONET direct sun algorithm (AERONET website, 2011)" implying a difference between the AERONET direct sun version algorithm for AOD and Dubovik code for analyzing the radiation components (diffuse measurements).

In any case, to avoid any misunderstanding, we have modified the related sentences so to make clear the difference between the Dubovik code for radiance inversion, and the direct sun version 2 algorithm for AOD.

REVIEWER COMMENT: A note on the Figure 3 comparison: The authors show in Figure 3 distinct seasonal variation in AOD that they attribute to ': : :inaccuracies of the solar position and optical mass routines implemented in the sunrad mode 1. This effect is strongly apparent in the temporal evolution of the differences, shown in Fig. 3. These rms deviations are still below the AERONET estimated uncertainty for a field instrument (0.01–0.02 uncertainty depending on channel, higher at shorter wavelengths).' We conclude the seasonal cycles in ESR's AOD show a poor computation accuracy and should be corrected as correct algorithms are widely available. The paper states, "These algorithms are very similar to those implemented in version 2 of the AERONET sun direct algorithm (AERONET Website, 2011). Therefore, our results should be the same as the Cimel AERONET measurements." Figure 3 demonstrates that this is not true.

AUTHOR RESPONSE: ESR modes 1 and 2 are different. While mode 1 is equivalent

to Skyrad version 4.2, mode 2 employs newer routines that are equal or closer to AERONET. In the reviewer comment, the second statement extracted from the paper does not correspond to the first statement, so we think the implications are mixed or confused, and therefore we will try to make it clear here.

Figure 3 was obtained by using ESR mode 1. The mode 1 algorithms were extracted from Skyrad version 4.2 for homogeneity with this version of SKYNET. As it is stated in the paper and emphasized in your comment, the figure demonstrates that the mode 1 results are poor in relation to AERONET. However, it is our main interest to keep the consistency with this version of Skyrad/SKYNET and show the effect of using these algorithms.

However, this effect disappears in Figure 4, when ESR mode 2 is used instead. This mode was developed with newer published algorithms, closer to AERONET. As the seasonal effect disappears and the agreement is noticeable, we stated that our results (for mode 2, but not mode 1) are the same than AERONET.

Therefore, we think that the conclusions in the paper are right. If we updated the sun position algorithm from mode 1 we would lose the targeted objective of providing an ESR mode consistent with previous analysis of Skyrad 4.2, in spite of being different from AERONET. If you agree with us, we will not modify it, although we can correct slight defects in the sentences

Finally, and following the suggestion of reviewer #1, we have included a brief discussion of the errors introduced by the algorithms used in both modes 1 and 2 (air mass and solar coordinates).

REVIEWER COMMENT: The paper states that the sunrad and skyrad modules were made available in 2011 from the ESR web site, but they are not (see http://www.euroskyrad.net/download.html) as of 23/03/12.

AUTHOR RESPONSE: It was our plan to update and complete the website before the

article was finally published in ACP. Unfortunately it was not updated at that time (we are updating it these weeks). We have corrected the dates in the reviewed version.

Moreover, before we made available the package in the website, we wanted to be sure we would not correct any part as a result of the reviewing process.

The website text is being largely changed, as it was very old. We are including a change in the objectives too. The ESR network is defined now as a European network of Prede instruments and federated with SKYNET. We will continue providing the ESR.pack as a tool for independent researchers, but our objective is to perform the same centralized processing than SKYNET in Asia to improve traceability.

We would be glad if you could send us your feedback about the new contents once they are made public, so to avoid introducing any misunderstanding in the community.

REVIEWER COMMENT: The paper states, "Ozone columnar burden has been obtained from the OMI sensor and correspondingly interpolated for any instantaneous measurement (OMI website, 2011). NO2 and water vapor were not available at this site, so they have been selected from published climatological values and standard atmospheres (Gueymard, 2001)." Here, there is no effort to obtain column values of NO2 in the same way as Ozone? This clearly illustrates the problem of lack of standardization with an open source code. The local user will be forced to use their version of external data to make the corrections. The result will be variable results across the network calling into question intercomparability between sites. The use of NO2 products is described on the AERONET web site.

AUTHOR RESPONSE: For the application of ESR.pack in the centralized processing, we plan to use three different levels of analysis:

Level 1.0: nominal or climatological gas contents will be used. Level 1.5 and level 2.0: actual measurements from satellite will be used in a periodic but delayed re-analysis of the data.

Although we plan to obtain a climatology of ozone and NO2 burden in Europe for the centralized processing of data, we still do not have it available. As we believe that the influence of NO2 burden has a relatively less important effect than ozone (in fact we believe that the NO2 was not considered at all in the version 1 of the AERONET sun direct algorithm, neither in Skyrad 4.2) for the article we decided using only a nominal value, that must be for sure be substituted as soon as we can obtain an European climatology of these gases.

REVIEWER COMMENT: I hope the authors will modify the manuscript based on these comments to accurately put into perspective the ESR source code for the scientific community.

AUTHOR RESPONSE: Once more, we would like to thank you for your important comments and we hope you agree with our responses and the future reviewed version of this article. Although we could not upload our answers during the interactive stage of the review, we will be glad to address any other issue by further private discussion.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 4341, 2012.

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