**Atmospheric
Chemistry
and Physics**
Discussions
Open Access

Interactive comment on "Aerosol radiative effects in the ultraviolet, visible, and near-infrared spectral ranges using long-term aerosol data series over the Iberian Peninsula" *by* D. Mateos et al.

Anonymous Referee #2

Received and published: 29 April 2014

General comments

This paper by Mateos et al. presents data on aerosol optical properties and direct radiative effect (ARE) obtained at different Iberian sites in the long-term period 2001-2012. The main aim of the paper is to analyse the trend in aerosol content, properties and their radiative effect during this time interval in order to provide an aerosol climatology over the whole Iberian Peninsula. The ARE has been calculated separately in four spectral regions (UV, VIS, SW, and NIR) and its dependence on the absorption

C1922

properties and size of particles has been investigated. The objective of the paper is appealing, however I have several comments about data analysis, discussions, and presentation which are reported in the following.

One of my main concerns regards the discussion of the results, which appears very poor and restricted to basic considerations. For instance, in Section 4 last paragraph, you present the results of Figure 4 without practically providing any comment. What is the cause for the trend? The reduction of emissions in Spain? The change in dust outbreaks occurrence? Is there a seasonality in this trend which may help to understand? Is there a connection with climatic indices (NAO, for instance) which may explain part of the interannual variability? Have you investigated that? Similar consideration are related to Section 5, where the discussion does not provide additional elements.

My second main concern regards the fact that part of the ARE analysis and discussion does not provide neither new methods nor results. The obtained ARE values and the dependence on SSA, as also discussed by the authors, are in good agreement with several other studies performed in the Mediterranean basin. So basically the results of this paper confirm things that we already know. In my opinion, the most original and interesting part concerning ARE estimates is the discussion of the different spectral contributions (UV, SW, Vis, NIR), which unfortunately I have found only at the end of Section 6. I suggest the authors to consider reorganize the discussion around ARE estimates, especially in Section 6, in order to better highlight their findings.

Third point, the analysis of uncertainties is not completely developed. For instance, can you provide error bars in Fig 4.? Also, it is not clear how the ARE uncertainty has been estimated. A certain number of assumptions have been performed to implement model calculations (Sect. 3), however the possible effect of these assumptions on the calculated ARE is not investigated (see for instance the specific comments below). To assess these uncertainties is however necessary to better constrain your results.

C1923

Finally, for what concerns the presentation of data and results, I find that the paper is quite repetitive in some parts, Sections 4 and 5 in particular. Also, I have the impression that Figs. 4-5-6-7 have in part similar "messages", so probably they could be reorganized in order to merge them into 2-3 figures only.

In conclusion, as it is in the present form, in my opinion the paper does not have the maturity to deserve publication. There are several parts/aspects that need to be consistently revised in order to improve the quality and impact of the results. For these reasons I reject the paper as it is in the present form.

Specific comments

Introduction : I find that the scientific context and the main objectives of your study are not very well constrained. In particular, the second paragraph is quite confused; it seems for instance that you are interested only on dust, while also other aerosol types are investigated in the paper. I suggest you to revise this part.

Section 2, pg. 8785, line 19: this 1% difference should be added to the SSA uncertainty

Section 2, last paragraph: how the SSA 0.90 and g 0.75 have been chosen? Can you add references for this? How can you state that this choice "provides a good characterization of the aerosol absorption"? Can you evaluate the uncertainty on your estimated ARE based on this assumption? Have you performed sensitivity tests to support your statement? Moreover, in line 27 I would avoid the expression "we think".

Section 3, pg. 8786, lines 12-13: I do not understand the meaning of this sentence? It means that in the cited papers (Bilbao 2011 and Mateos 2013) the authors provide with comparison of modelled irradiances with measured data?

Section 3, pg. 8787, lines 13-14: you assume wavelength independent optical properties in the different considered spectral intervals. Can you provide an estimate of the uncertainty induced by this assumption?

Section 3, pg. 8788, lines 11-12: I would eliminate "daily" since the relation is general.

C1924

Section 3, pg. 8788, lines 11-17: there are several repetitions in this paragraph, please rewrite it in a more concise and clear form.

Section 4 and Figure 4: can you specify the number of datapoints or measurement days for each year? Are they uniformly distributed throughout the different seasons for the different years? What about cloud cover? It is possible that some differences in the annual values reported in Fig 4 are related in part to specific episodes, such as for example an enhanced cloud cover during specific periods which has affected CIMEL measurements?

Section 4, pg. 8790, lines 5-15: how your classification is in agreement with the selection criteria by Toledano 2007 and Pace 2006? In line 14, what does it mean that "the value could be adjusted to the site"? How? Line 15, there is a repetition.

Section 5, pg. 8792, lines 1-2: I do not agree when you say that in the NIR the ARE seems more stable; I have the impression that there are not significant differences between the different plots in Fig 5.

Section 5, page 8792, lines 26-27: I guess the larger contribution in the visible is due to the fact that the max of the solar spectrum is found around 700 nm.

Figures 4 and 6: I suggest adding error bars in the plots.

―――――――――――――――――

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 8779, 2014.