

Interactive comment on “Effect of wind speed on aerosol optical depth over remote oceans, based on data from the Maritime Aerosol Network” by A. Smirnov et al.

Anonymous Referee #1

Received and published: 9 December 2011

The Marine Aerosol Network (MAN) provides a growing treasure trove of consistent aerosol optical depth (AOD) data over the midocean. This paper uses this data set to take a fresh look at the relationship between wind speed and AOD. The analysis is straightforward and sound, and the results stand up to scrutiny by using redundant sources of wind speed data, a thorough comparison with previous studies and even a serious attempt to track the source of the scatter in the regressions. I also much appreciated that the paper was short and to the point.

I have some concerns with the subjective cleaning up of the data for analysis (the

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cherry picking), but the authors are honest about it, and I accept the need to clean things up in order to pull out the signal. I wonder though about all the comparisons with the literature. I'm sure each of these other studies also does their share of cherry picking, but may be less forthcoming about it. How much of the differences between studies are due to the subjective data selection? How much of the comparison shown in the present paper is apples and apples, and how much is pitted cherries against cherries with pits. Also, the paper states that 239 measurement days remain after sorting. I would like to know, out of how many? This is not a serious issue with the analysis, just something to keep in mind as one considers the results, especially with the comparisons.

However, the main fault of this paper is in its presentation, the text also, but mostly the figures.

First the text,

What does “series” mean? What is “the AOD measurement series”? At the bottom of p 7191, “The series and daily wind speed differences are comparable.” Is “series” here the same as “instantaneous” above? What is “daily”? Is it the “NCEP 24 hr” wind? Why is there “series” and “daily” in Fig. 3a, but 5 different designations in Fig. 3b?

“steady state” is used in the latter half the paper, but in the beginning it was “steady winds” or just “steady”

Why does the current study appear in the middle of Table 2. At first glance I didn't even realize it was there. Then the reader is referred back to Table 2 to get the steady state case, I had no idea what was going on. Can the current study be listed first, and maybe highlighted in the table in some way?

The discussion of the uncertainty analysis was difficult to follow. The only uncertainty that was tested was noisy data, and these alone introduce sufficient scatter in the correlation to match the values found in the actual data analysis. Is this enough

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to conclude that meteorological effects are not making significant contribution to the scatter of the real data? What about non-linear relationships? What meteorological effects might introduce scatter? What if there had been less cherry picking? A bit more or clearer discussion here would help. Then in the Conclusions, p. 7195, "... which were perfectly correlated in truth to around 0.5." The way I read it was that the analysis starts with a distribution of wind speed and then that is used in a regression equation to produce a distribution of AOD. Those two sets should be $R=1.0$. Where does the 0.5 come from?

p. 7190, "Additional consideration of the subset acquired with 390-650 S did not produce any correlation either." 390-650 S is the entire range. How is this different?

p. 7191, "Figure 2a shows AOD daily averages as a function of latitude, and Fig. 2b presents corresponding daily averages of the ship-based wind speed also as a function of latitude." Clarify that the wind speed plot is also a function of latitude and not AOD as a function of wind speed.

p. 7194, "The last figure is similar..." Use instead, "The last number is similar..." or "The last value of correlation is similar..." Figure has the connotation of another plot in Fig. 7 or elsewhere.

And now the figures,

It is very difficult to see any of the plots. They are small with fine line widths.

Specifically, the Pacific points in Fig. 2 are faint.

The daily points in Fig. 3a are faint. I cannot see at all the points or curves for anything other than ship-based and NCEP in Fig. 3b. It is like a figure with only two lines.

Fig. 4 offers no information. I can only see the top layer of points. Why show all wavelengths if you cannot see them? Maybe show points for one wavelength and regression lines for all? I cannot see the regression lines. At the very least these should be plotted on top of the points. Actually there are too many points for a simple

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scatter plot. These should be contour plots for one wavelength, or what I would do is bin them and plot the average of each bin with standard deviation in each bin given by error bars. You could show all 4 wavelengths then. Just make sure that the regression line is calculated from the cloud of points and the binning and averaging is just a technique for plotting. The paper concludes that the relationship is linear. There is no way to make that conclusion. Something must be done with these plots before the paper is published.

Fig. 5 is better. I can at least see the regression lines, but these are still too busy to really get information out of them. Here perhaps just show one wavelength.

Fig. 7 coupled with the text referring to this figure just completely confused me. What am I looking at? This is noisy wind speed against, non-noisy AOD? Or is it noisy wind speed against noisy AOD? Should we have $R=XX$ on the plot to match it with the text? The caption says 'shown in black'. What is shown in black? I don't see any thing. And then, so what? I don't see how this figure adds any information. What if there were four panels: non-noisy AOD vs. non-noisy wind speed, non-noisy AOD vs. noisy wind speed, noisy AOD vs. non-noisy windspeed and finally noisy AOD vs noisy wind speed, each with its $R=XX$ in the corner so you could match it to the text. I think this would illustrate the uncertainty analysis much better. I'm grateful for the contour plot, though. This is much better than the cloud of points in Figures 4 and 5.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 7185, 2011.

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