Atmos. Chem. Phys. Discuss., 9, C10804–C10808, 2010
www.atmos-chem-phys-discuss.net/9/C10804/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatio-temporal aerosol optical characteristics over the Arabian Sea during the pre monsoon season" *by* D. G. Kaskaoutis et al.

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Received and published: 13 February 2010

For Anonymous Referee short comment/Referee #5 The cruise based sunphotometer measurements were made at specific locations during day time, or in other words they correspond to measurements made at point locations.

Reply: The cruise measurements were obtained along the ship cruise covering nearly the whole daytime (on each day) and not at point locations. This fact, in combination with the nearly whole coverage of the AS, allows us to prepare the spatial distributions of the aerosol properties. This has also been done in previous publications from the ICARB or other campaigns. We agree that the spatial distributions do not correspond to

the whole measuring period (18 April – 10 May), but the MODIS data over AS averaged in this time interval show similar distributions. In the revised version we discuss these things.

Please note that most of the results in this manuscript have already been published by the authors in Kalapureddy and Devara (AE, 2008) and Kalapureddy et al. (JGR, 2009).

Reply: The research topic here is very clear, that is the detailed investigation of the errors computed by the polynomial fit even in two wavelength bands. The spatial and temporal distributions of a1 and a2 are provided for the first time and the differences caused by the use of different spectral bands are highlighted. Also, in the revised version the classification scheme of Gobbi et al. (2007) is applied for the time over an oceanic environment. In contrast, in AE the results seen at various oceanic location of India (BOB, IO and AS) have been discussed in the light of the back-ground information and source and sinks. The main topic of the JGR paper was to investigate the different aerosol types over the AS sub-regions and their association with the distance of the coast and the natural and anthropogenic aerosols. In the revised version we avoided the repetitions, but we maintain the AOD and alpha spatial distributions for better understanding of the new results. For example, the first figure (cruise map), which has been repeated in almost all publications of this cruise results, is again using here for helping the reader in understanding the results. Note also, that the AOD and alpha spatial distributions are now given in a more detail than the previous papers (e.g. AE) emphasizing only over AS. The spectral AOD temporal distribution using all the available dataset and not daily means is given for the first time, as well as the respective alpha temporal variation, even using two wavelength bands.

The measurements were made over both Bay of Bengal and Arabian Sea, interestingly only results obtained over the Arabian Sea are re-reported!

Reply: This is true. Initially we used the whole data set covering IO, BOB and AS for

AE paper. But later, we decided to confine to the AS for two reasons. I) explore the pre-monsoon AS region vigorously due to its importance and implications on the forth coming monsoon, and ii) due to keep morals with whole team understandings on using cruise data, we confined only to AS.

Mean AOD values differ between AE and ACPD - mean AOD over AS during the same cruise is written as 0.23+/-0.09 in AE, 2008, while in the present manuscript (ACPD) the mean AOD at the same wavelength (500 nm) is written as 0.246+/-0.114 – why there is a difference, if the same data sets were used?

Reply: This is mainly due to the inclusion of new data set for the days 24-27 April in the present paper than to AE.

The inferences drawn based on the curvatures differ among the publications, indicating that the authors are not clear about the theoretical concepts on the curvature effects. For example, in the abstract of AE, 2008 the authors Kalapureddy and Devara mention that coarse mode particles dominated over the Arabian Sea thereby gave rise to negative curvature. But, on the contrary, in ACPD manuscript the authors mention that "coarse mode represents positive curvature (lines 5-10)".

Reply: Both statements are true! The AE paper examines the term “second derivative of the Angstrom exponent” (a’), which is equal to –2a2. Therefore, negative a’ values correspond to coarse-mode particles. In the abstract of the AE paper it is clearly stated that the negative or positive values are referred to a’. In the ACPD paper we examine the curvature of the polynomial fit, the a2 value. Page 22249, line 6 - the authors mention that "In the majority of the cases a2 was negative, ..." On the contrary in their JGR paper (Figure 11), and AE (Figure 6a) most of the a2 is greater than zero! - why?

Reply: As regards the AE paper, this is occurred due to the lack of the dataset during the period 24-27 April, and due to the fact that the examined parameter was the a’, not the a2. The new results (a1 and a2 values) in the revised ACPD paper are somewhat different from the previous ones and those of JGR paper, since in the revised we

applied the Cachorro et al. (2004) method for further calibration of the results and we excluded cases that the polynomial fit had no satisfactory accuracy.

Figure 5b in ACPD is already published as Figure 12 in their JGR paper.

Reply: Figure 5a, b was removed from the revised version.

Also, it be noted that some points above zero which present in Figure 12 are missing in Figure 5b of ACPD.

Reply: This is due to the fact of further calibration and accuracy of the retrievals in the ACPD paper. However, Figure 5 was removed.

Further, Figure 7 of ACPD is drawn already as Figures 3 and 4 in JGR.

Reply: This figure was removed from the revised. However, the JGR paper showed the frequency distributions of AOD and alpha over three AS sub-regions.

In Figure 10 most a2 values are negative, while in their JGR paper (Figure 9) most a2 values are positive. Why this difference? Also, a1 values is much more negative in ACPD (Figure 10a) while in their JGR paper maximum a1 is -2.0.

Reply: This is mainly due to further calibration of the AOD values using the Cachorro et al. (2004) method. However, the a1 and a2 values are now somewhat different due to consideration of the WVC and temperature sensitivity effects in AOD values in the NIR.

Figure 12 in ACPD are the same as Figure 8 except that it is at 500 nm. This kind of figure is not correct as the measurements was obtained at certain locations and not over the Arabian Sea as shown in Figure 12. Figure 13 is the same as Figure 9. Figure 14 is the same as Figure 10. Both Figures 13 and 14 can’t be plotted for the reason that they are point measurements. Figure 15 is the same as Figure 10.

Reply: In the first scale of this objection, we have already replied (see our first reply). The first figures show the temporal variation of the aerosol parameters, while the sec-

ond their spatial distribution over the whole AS region. It is very common to provide these data for better understanding of the results. Showing the temporal variation, the reader can have a more clear view of the values of the examined parameters and viewing the spatial distribution figures to understand which areas in AS have low, mid and high values of each of the examined parameters.

Only major comments are described. Keeping in mind that (a) most of the results are not new, (b) have already been published, and that (c) most of the figures in ACPD are repetitions from the same paper, this manuscript does not warrant a publication in ACP in its current form.

Reply: Now the modified paper avoids the repetitions and has been shortened, also including some new results. The great care taken for calibration and correction of the dataset, the detailed investigation of the errors even in two spectral bands, the inclusion of a1 and a2 distributions, are new results over AS during ICARB.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/9/C10804/2010/acpd-9-C10804-2010-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 22223, 2009.