

Interactive
Comment

Interactive comment on “Capturing vertical profiles of aerosols and black carbon over the Indian Ocean using autonomous unmanned aerial vehicles” by C. E. Corrigan et al.

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Owing to an insufficient number of referee comments, as associate editor I am providing a referee comment on the discussion paper and making my publication recommendation based on my assessment and the single referee comment.

Firstly, I would like to congratulate the authors on a well-written and important piece of work. Measurements of the vertical and horizontal variability in aerosol properties are important in evaluating estimates of aerosol direct radiative forcing and the effects of aerosol on clouds. New generation AUAVs present a novel opportunity to efficiently provide such measurement data. This manuscript reports a description of an extended

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period of observations over the Indian Ocean using miniaturised instruments onboard a fleet of AUAVs. Measurements included total aerosol number by CPC, size distributions by OPC, absorption by modified aethelometer, temperature, RH and pressure. Comparisons of in situ measured quantities with ground and intercomparisons between measurements on multiple AUAVs gave good apparent agreement as did directly measured absorption OD with AERONET columnar observations. The measurements of the atmospheric structure and size-resolved aerosol profiles, as expected, was capable of yielding information not accessible to remote sensing e.g. "p11439, the accumulation mode ($0.1 \text{ micron} > D > 1 \text{ micron}$) increased in proportion to the fine mode ($D < 0.1 \text{ micron}$), but this change would not have been associated with an overhead plume if profiling had not been performed" and "The presence of significant quantities of absorbing material at altitude likely had an effect on the 15 heating of specific atmospheric layers that could not be resolved using only surface based instruments". The combination of aerosol instrumentation profiling with measurements of thermodynamic structure was shown to provide a powerful tool to indicate the reasons behind stratification and the trajectory analysis was capable of source identification of the elevated aerosol concentration in layers aloft which were decoupled from the surface sources.

The paper is entirely within the scope of ACP and demonstrates how AUAVs can make important contributions to the field of aerosol / radiation impacts. I only have one or two suggestions for clarification and minor improvement:

p11436, line 25, what were the criteria used to identify "suspected cloud exposure"?

Figure 5. This is not the best way to present a size distribution intercomparison. Firstly it presents only 3 of the 8 channels and secondly they are not labelled. Two bin normalised N contour plots ($dN/d\log D_p$) against diameter and time should be plotted to give a fairer indication of similarity in the distributions (much in the same way as figures 12 a and b are used to compare size distribution change with altitude). This could be overlaid with a plot of altitude vs time (altitude on the second y-axis) to preserve all the information in the original figure.

p11441 and figure 13, were the error bars for 29th March representative of the measurements on all days? In any case, this should be stated.

Once these have been clarified, and the comments of the anonymous reviewer have been addressed, I recommend this paper for publication.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 11429, 2007.

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