

Interactive comment on “Study of columnar aerosol size distribution in Hong Kong” by X. Yang and M. Wenig

X. Yang and M. Wenig

xunyang@cityu.edu.hk

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We thank very much the second review's detailed suggestions on data investigation and text polishing.

Those typo errors have been rectified.

The daily wind direction variation recorded at the Wagland Island has been combined. Figure 1 shows its time series. During this season the wind turn gradually from southerly to northerly direction. The size distribution variation under high aerosol loadings with $AOD > 0.5$ has been investigated combining wind directions. Figure 2 shows its variation under northerly wind (wind direction $< 45^\circ$ or wind direction $> 315^\circ$), where the values of 0 and 360° correspond to the north direction. Figure 3 shows its

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variation from a larger mainland region (wind direction $< 90^\circ$ or wind direction $> 270^\circ$). Figure 4 shows its variation under southerly wind ($135^\circ < \text{wind direction} < 225^\circ$). Figure 5 shows its variation from a larger ocean wind ($90^\circ < \text{wind direction} < 270^\circ$). There are some missing lines as shown in Figure 4. It is due to the limited data number when subdividing the dataset with different wind directions.

Overall, the third mode could be observed and become more significant under higher Angstrom exponent that means more fine mode aerosols. The main difference is that the northerly winds are accompanied with higher aerosol volume concentrations and fine mode aerosols. Wind directions gradually turns from July to November. Figure 6 and Figure 7 are from different periods, July to September and October to November, respectively. They are quoted from the earlier reply for the first review. Together, it is found that the high aerosol loadings are the main reason for the appearance of the third mode and more fine mode aerosols are likely to increase the third mode. Similar sun-sky radiometer observations and findings have been shown in others' work, where hygroscopic growth and aerosol coagulation are attributed as the main cause. But we cautiously admit that the hygroscopic growth and aerosol coagulation are speculated rather than confirmed by those observations. And this hypothesis would be further emphasized in the revised paper.

We did not obtain the complete dataset for the relative humidity's daily variation. But the two values, minimum and maximum values of daily relative humidity, could be obtained from the Hong Kong Observatory. The mean daily difference is around $\sim 15\%$. The mean relative humidity is 77.5%. Therefore the minimum relative humidity still maintains at a high level, which can be roughly estimated to be higher than 70%. In fact, aerosol hygroscopic growth has been argued to be found with lower relative humidity than this value [Baumgardner et al., 2000; Dubovik et al., 2002; Singh et al., 2004].

References

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Dubovik, O., B. N. Holben, T. F. Eck, A. Smirnov, Y. J. Kaufman, M. D. King, D. Tanré, and I. Slutsker (2002), Variability of absorption and optical properties of key aerosol types observed in worldwide locations, *J. Atmos. Sci.*, 59 (3), 590-608.

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Please also note the Supplement to this comment.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 9, 8341, 2009.

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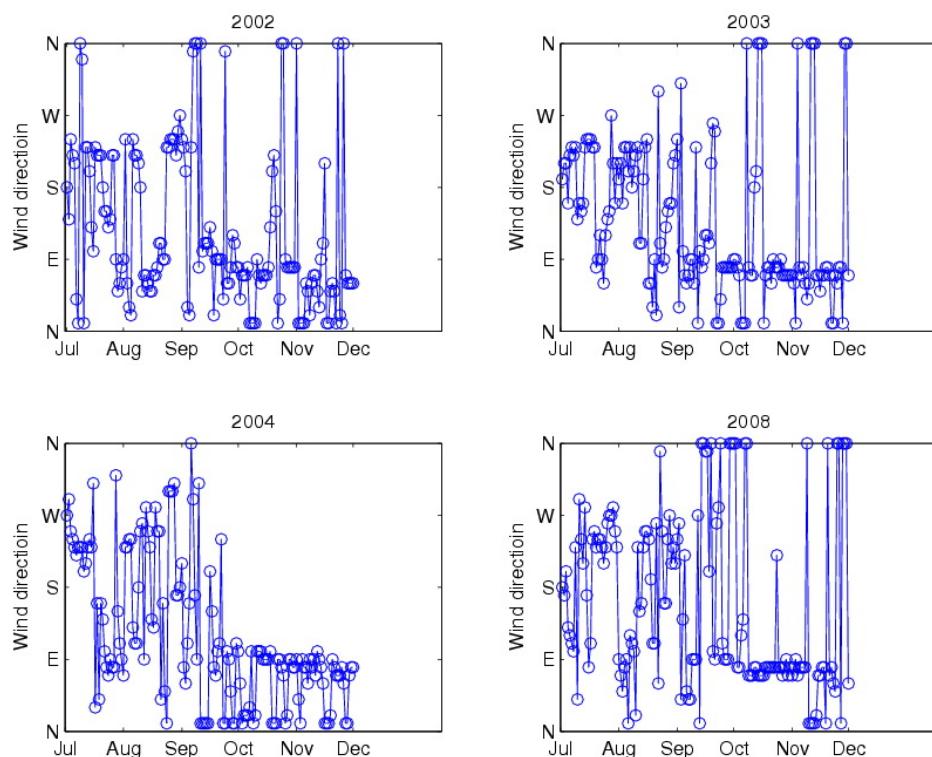


Fig. 1.

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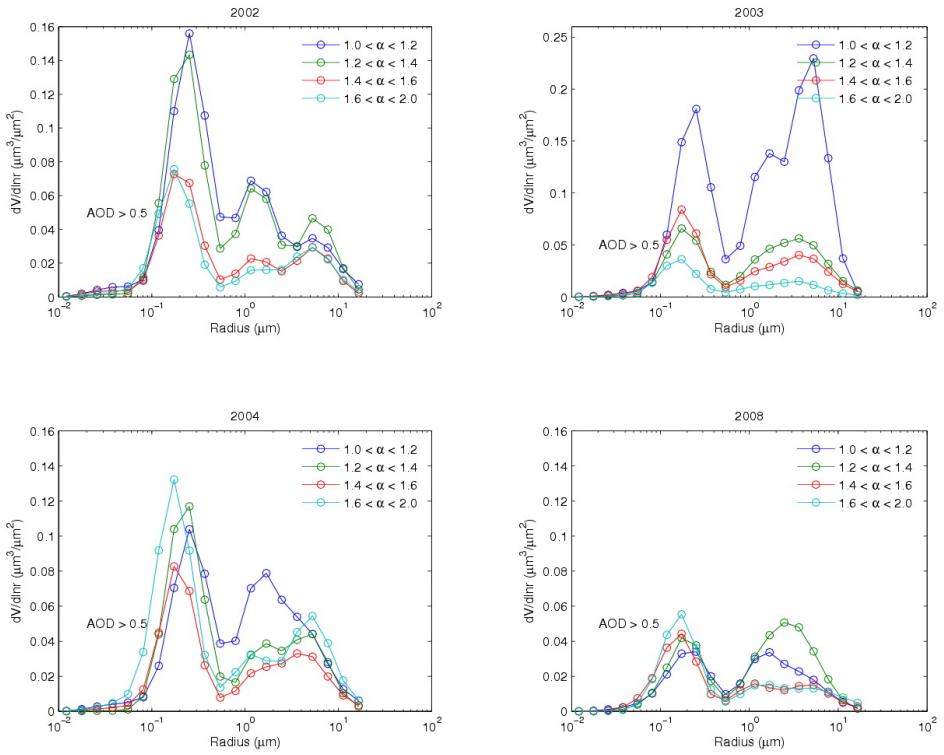


Fig. 2.

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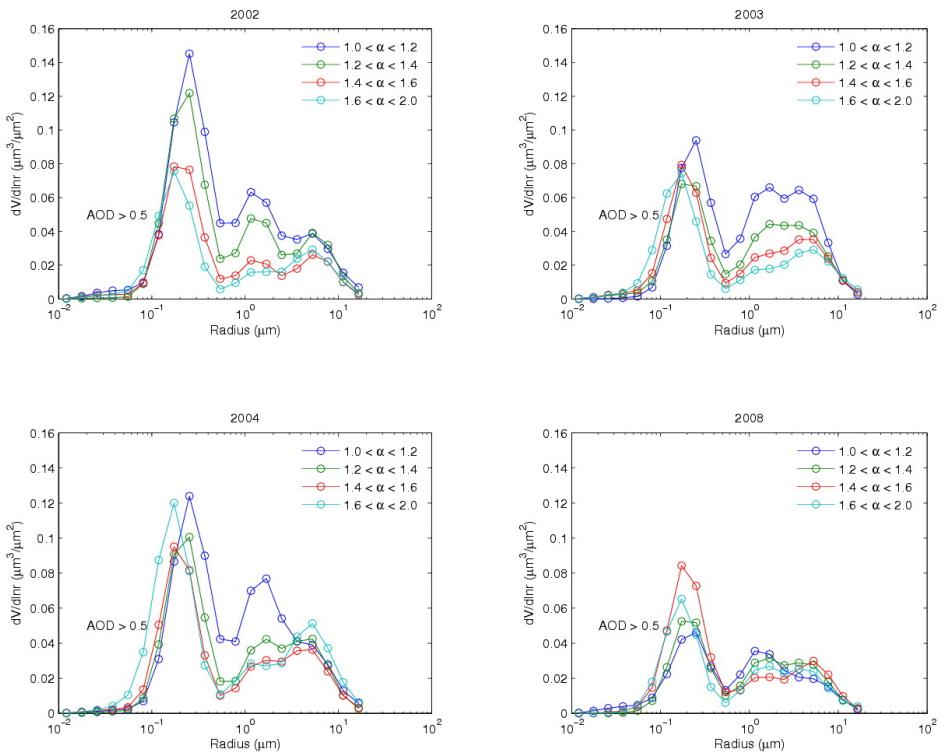


Fig. 3.

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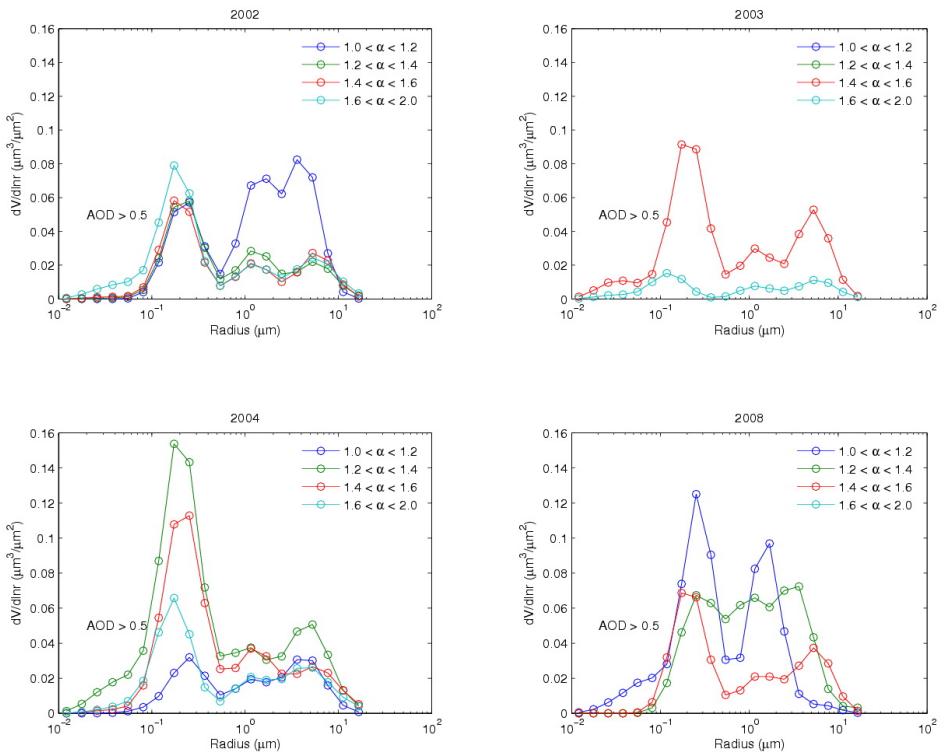


Fig. 4.

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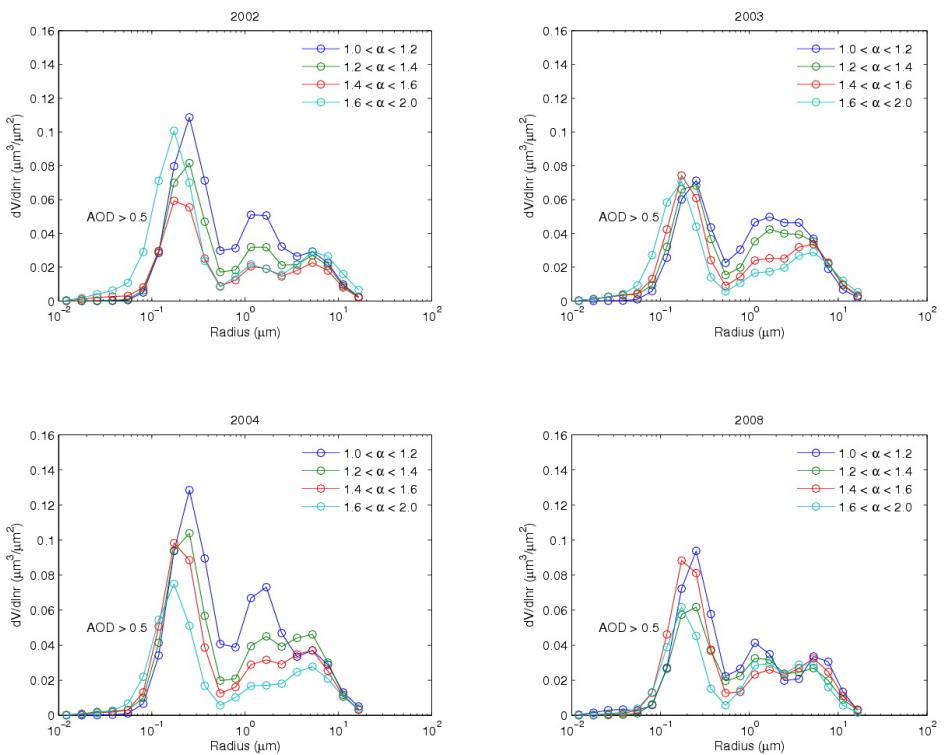


Fig. 5.

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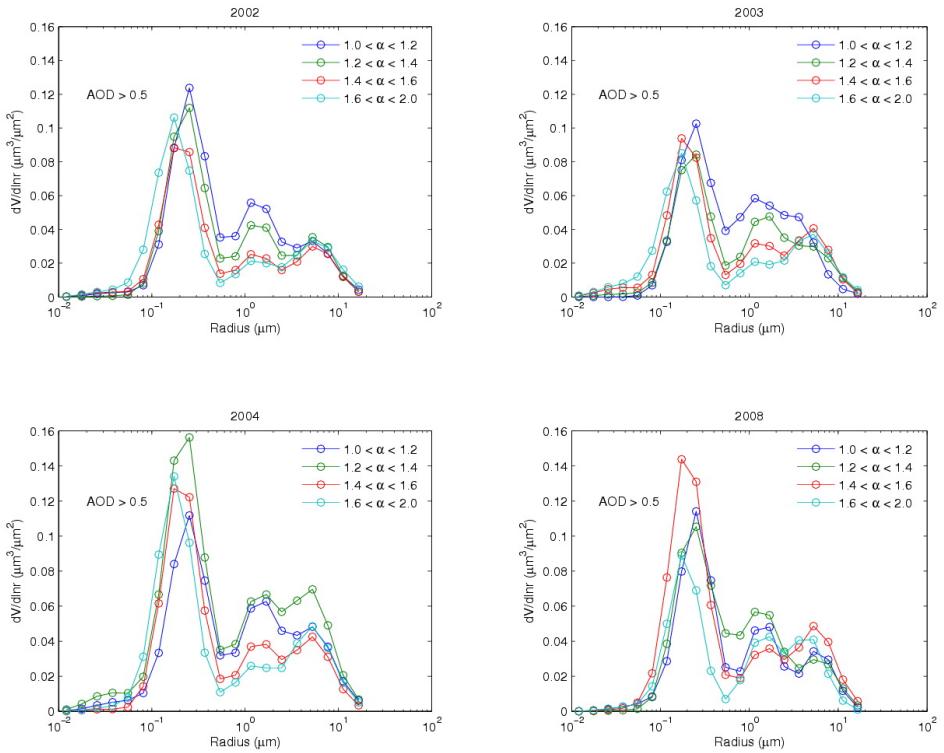


Fig. 6.

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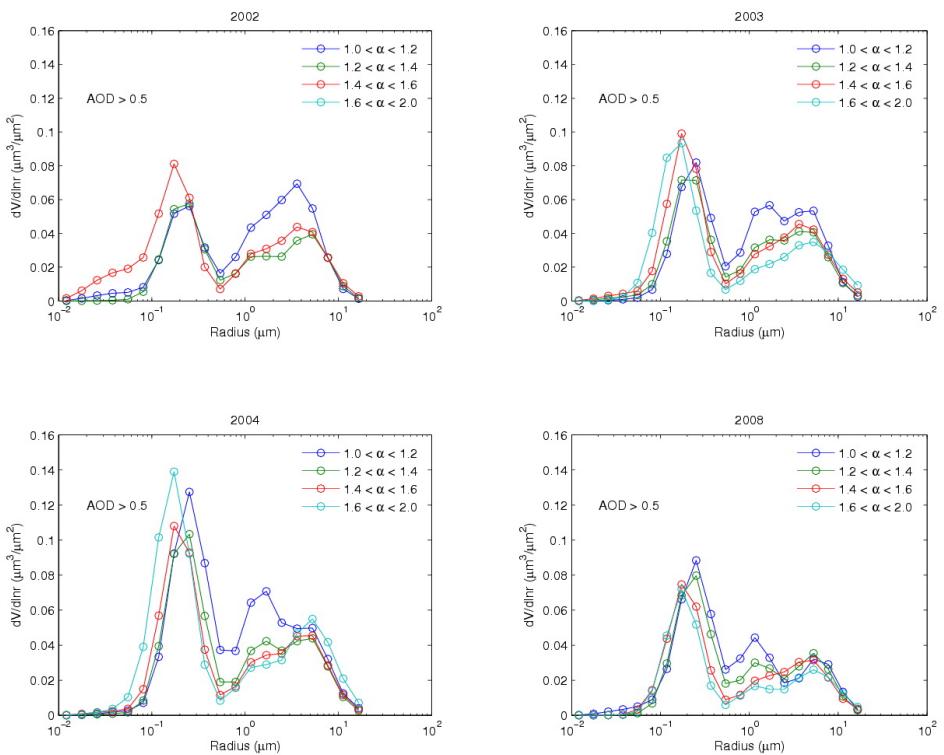


Fig. 7.

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