Supplement of Atmos. Meas. Tech., 15, 6807–6817, 2022
https://doi.org/10.5194/amt-15-6807-2022-supplement

Atmospheric Measurement Techniques
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Supplement of

New method to determine black carbon mass size distribution

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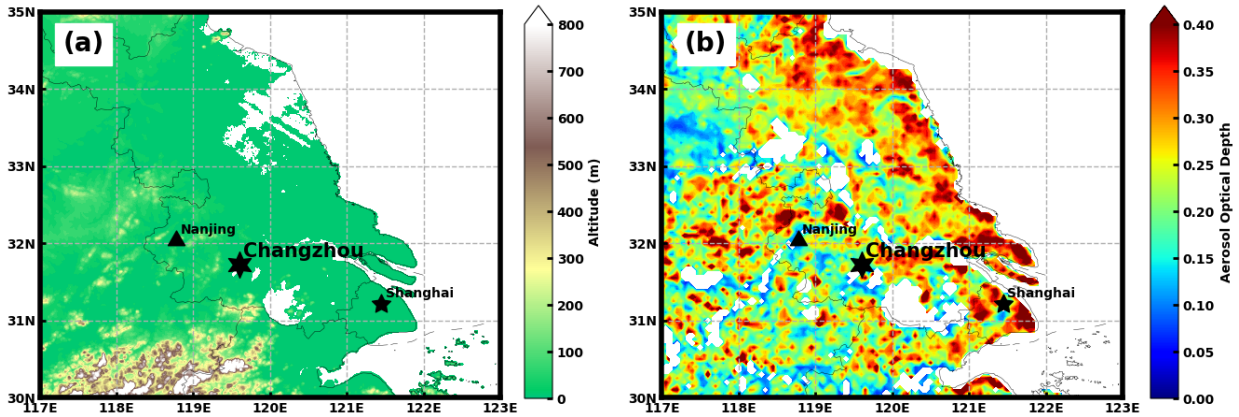

Figure S1: Measurement site of Changzhou marked with hexagram. Shanghai and Nanjing was marked with pentagram and triangle for reference. Colored contours represent (a) the topography of the Yangtze River Delta, (b) the aerosol optical depth at 550 nm averaged over the period of the field measurement from Moderate Resolution Imaging Spectroradiometer onboard satellite Aqua.

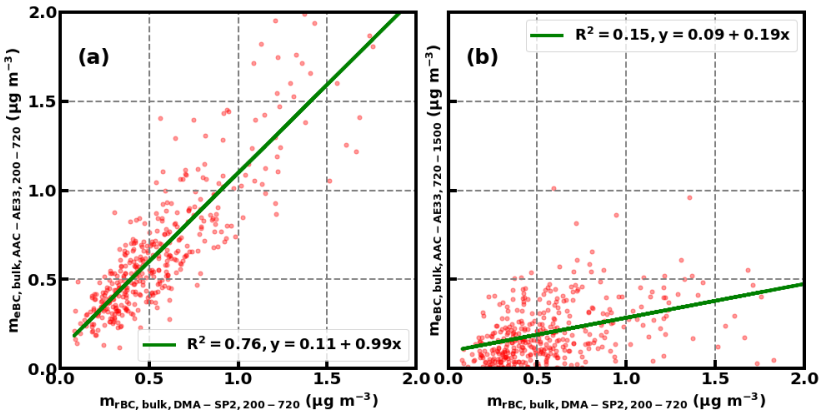

Figure S2: Comparison of $m_{BC,bulk}$ integrated from $eBCMSD_{AAC\text{-}AE33}$ and $rBCMSD_{DMA\text{-}SP2}$. $m_{BC,bulk}$ integrated from $rBCMSD_{DMA\text{-}SP2}$ was denoted as $m_{rBC,bulk,DMA\text{-}SP2,200\text{-}720}$. $m_{BC,bulk}$ integrated from $eBCMSD_{AAC\text{-}AE33}$ ranging from 200 nm to 720 nm (720 nm to 1500 nm) was denoted as $m_{eBC,bulk,AAC\text{-}AE33,200\text{-}720}$ ($m_{eBC,bulk,AAC\text{-}AE33,720\text{-}1500}$). (a) was the comparison between $m_{eBC,bulk,AAC\text{-}AE33,200\text{-}720}$ and $m_{rBC,bulk,DMA\text{-}SP2,200\text{-}720}$, (b) was the comparison between $m_{eBC,bulk,AAC\text{-}AE33,720\text{-}1500}$ and $m_{rBC,bulk,DMA\text{-}SP2,200\text{-}720}$. Red dots were data points and the corresponding linear regression was presented by green line.

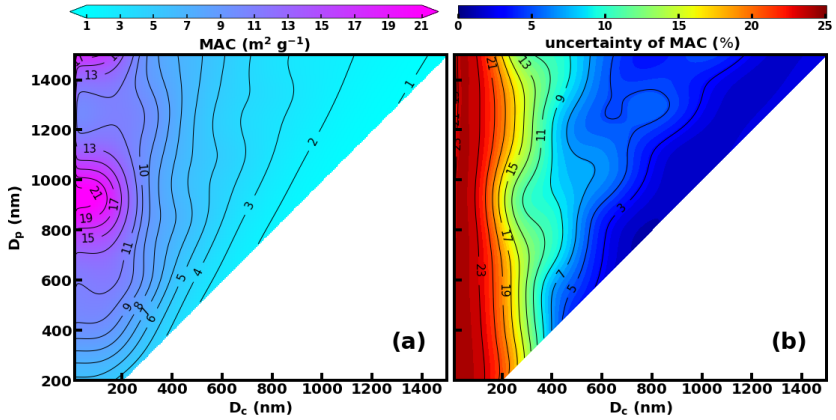

Figure S3: MAC lookup table (a) used in this study and the corresponding uncertainty caused by refractive index (RI) (b). The uncertainty was calculated by std of MAC divided by the mean MAC.

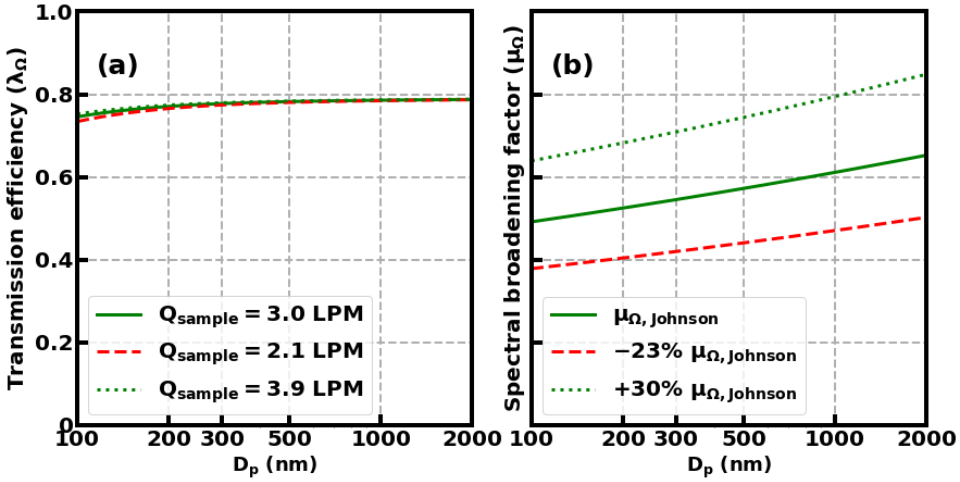

Figure S4: (a) The variation of λ_Ω with respect to D_p and sample flow (Q_{sample}). Q_{sample} used in this study was 3.0 L min^{-1} (green line). Q_{sample} was varied from – 30% (2.9 L min^{-1}, red dashed line) to + 30% (3.9 L min^{-1}, green dotted line) for uncertainty analysis. (b) The variation of μ_Ω with respect to D_p parameterized by Johnson et al. (2018) ($\mu_{\Omega,Johnson}$, green line). $\mu_{\Omega,Johnson}$ was varied from – 23% (red dashed line) to + 30% (green dotted line) for uncertainty analysis.

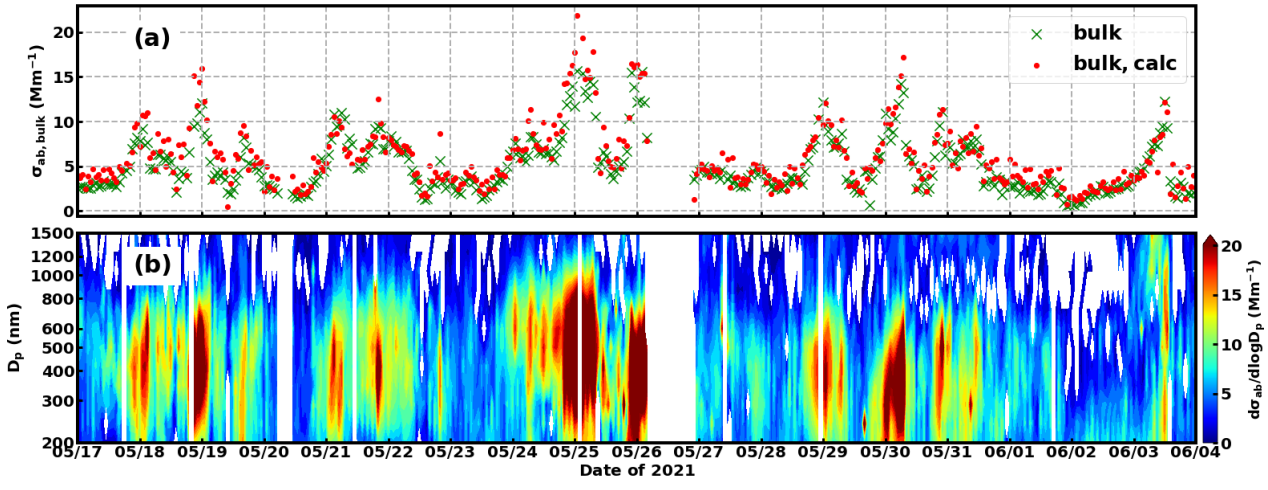

Figure S5: The time series of (a) $\sigma_{ab,bulk}$ (green cross) and $\sigma_{ab,bulk,calc}$ (red dot), (b) $\sigma_{ab,size\text{-}resolved}$.

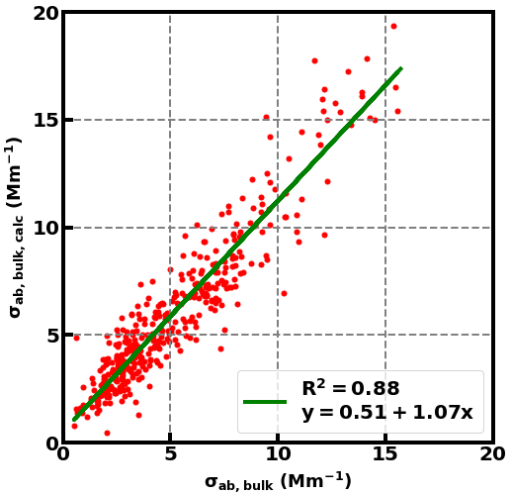

Figure S6: Comparison between $\sigma_{ab,bulk,calc}$ and $\sigma_{ab,bulk}$. The red dots were data over the whole measurement period (Fig. S4a). The green line was the linear regression.

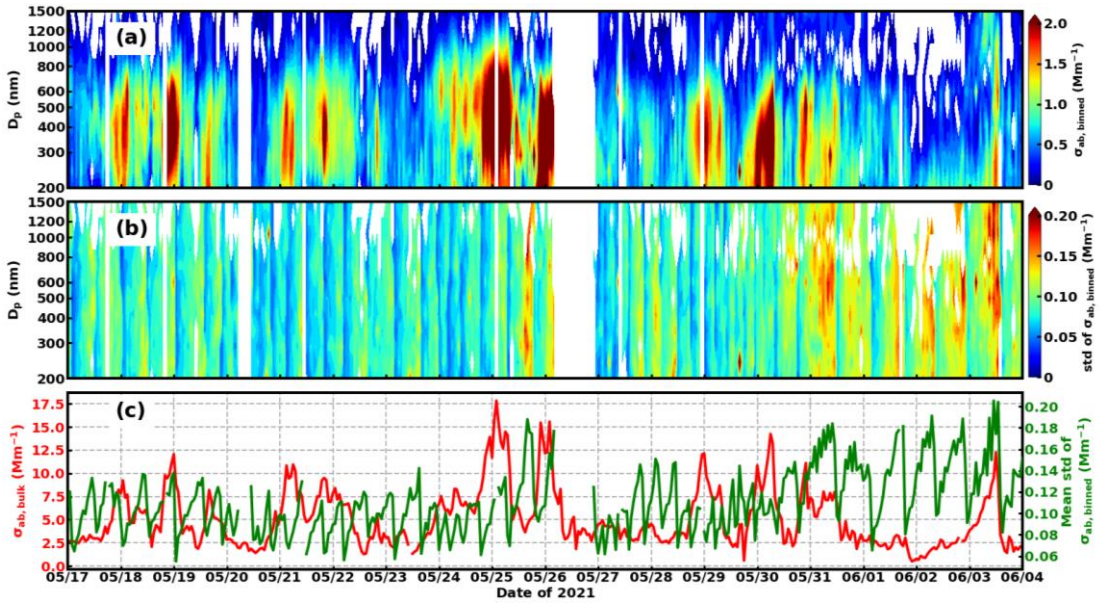

Figure S7: The time series of (a) $\sigma_{ab,binned}$, (b) corresponding std of $\sigma_{ab,binned}$, (c) $\sigma_{ab,bulk}$ (red line) and mean std of $\sigma_{ab,binned}$ calculated with respect to D_p (green line).

References

Johnson, T. J., Irwin, M., Symonds, J. P. R., Olfert, J. S., and Boies, A. M.: Measuring aerosol size distributions with the aerodynamic aerosol classifier, Aerosol Science and Technology, 52, 655-665, 10.1080/02786826.2018.1440063, 2018.