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*Supplement of*

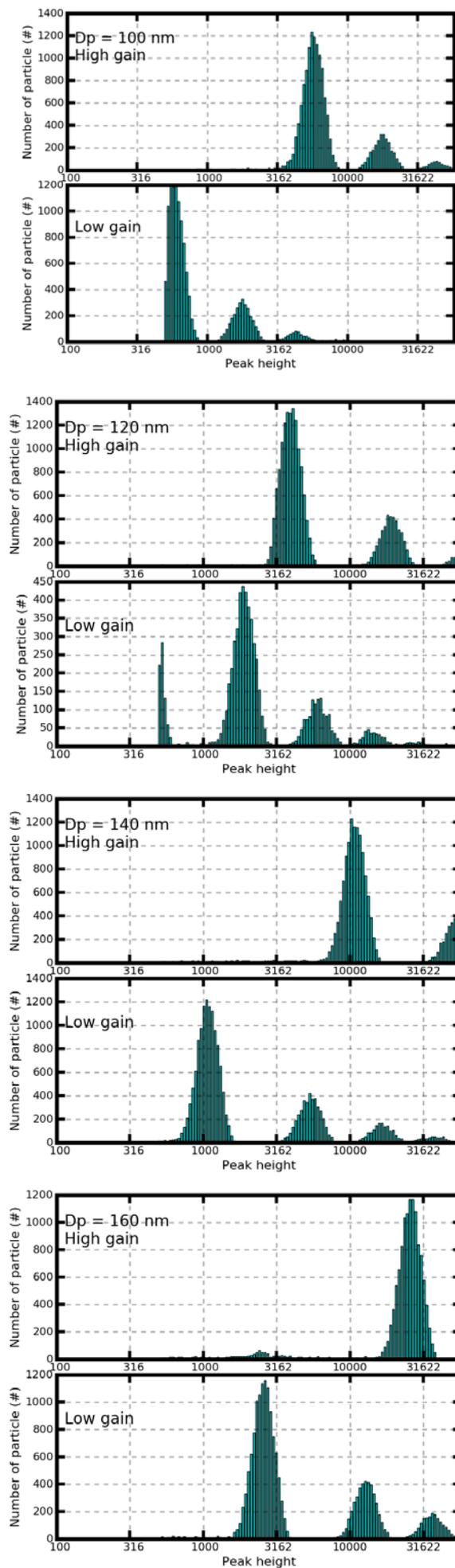
## **Method to measure the size-resolved real part of aerosol refractive index using differential mobility analyzer in tandem with single-particle soot photometer**

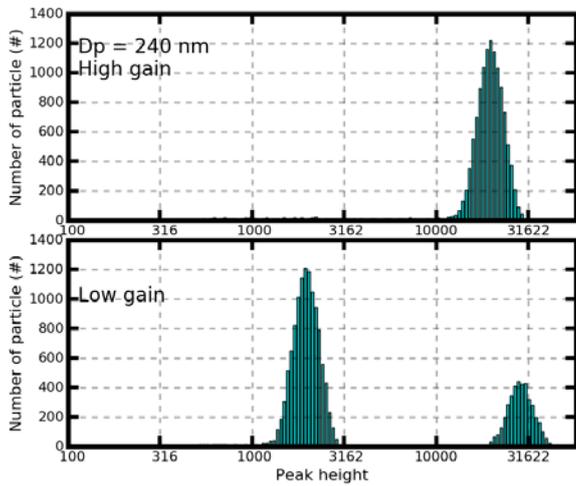
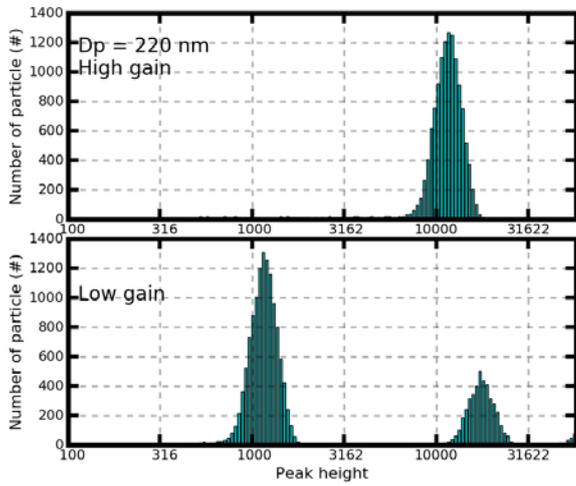
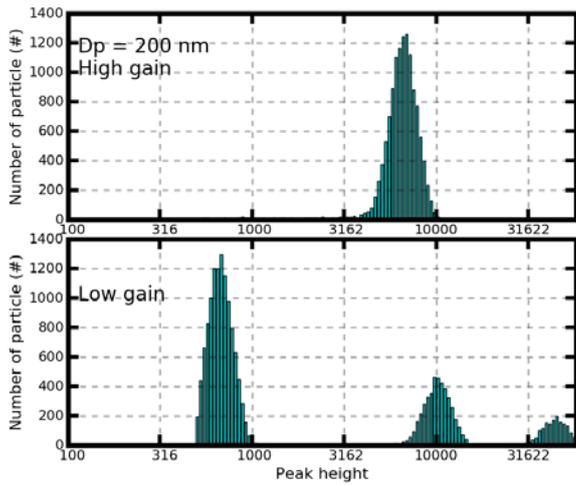
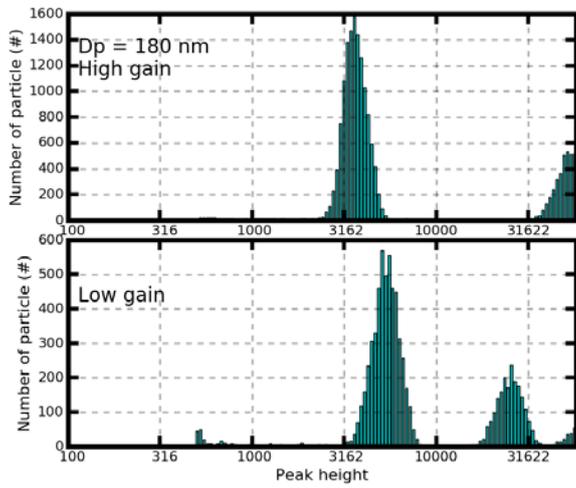
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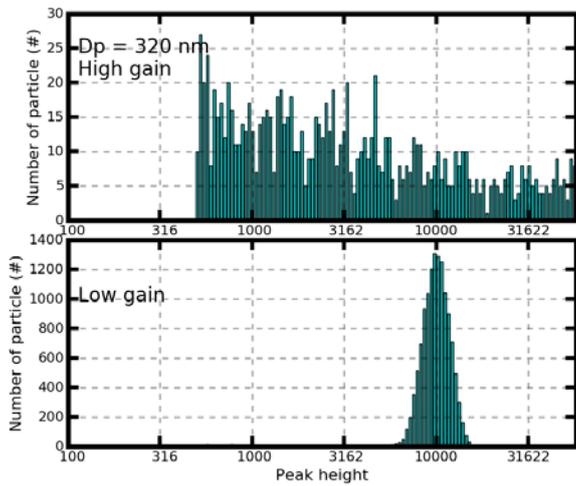
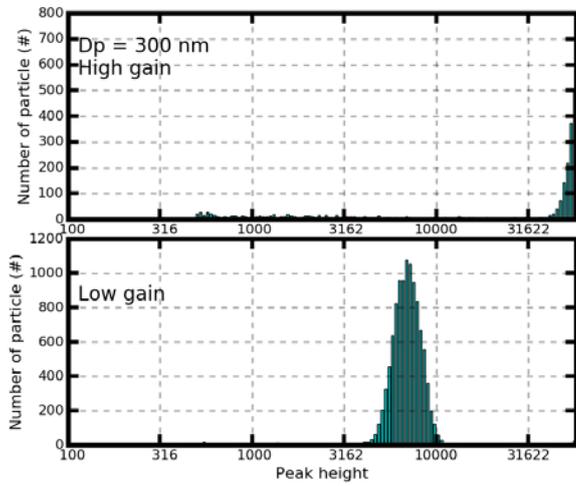
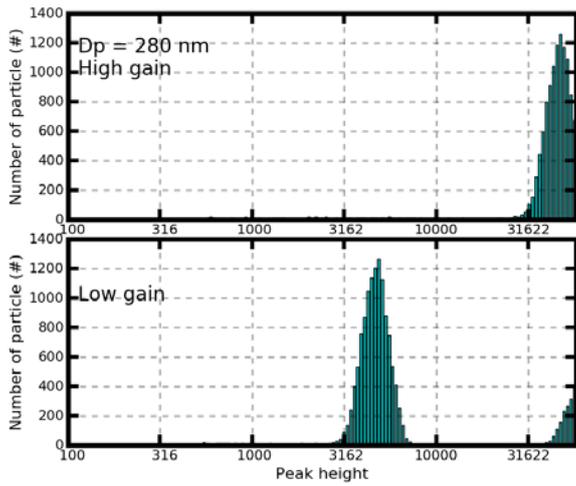
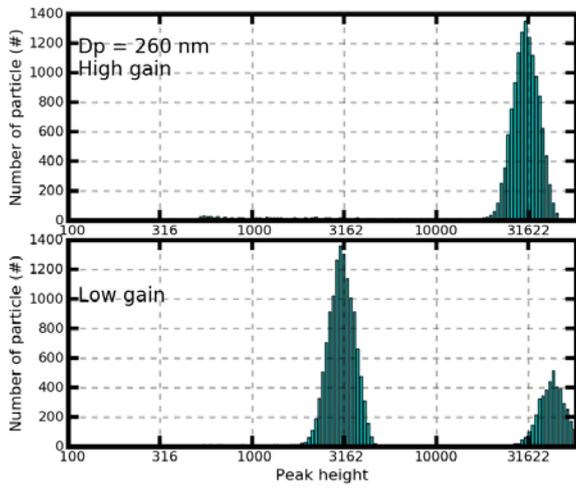
*Correspondence to:* Chunsheng Zhao (zcs@pku.edu.cn)

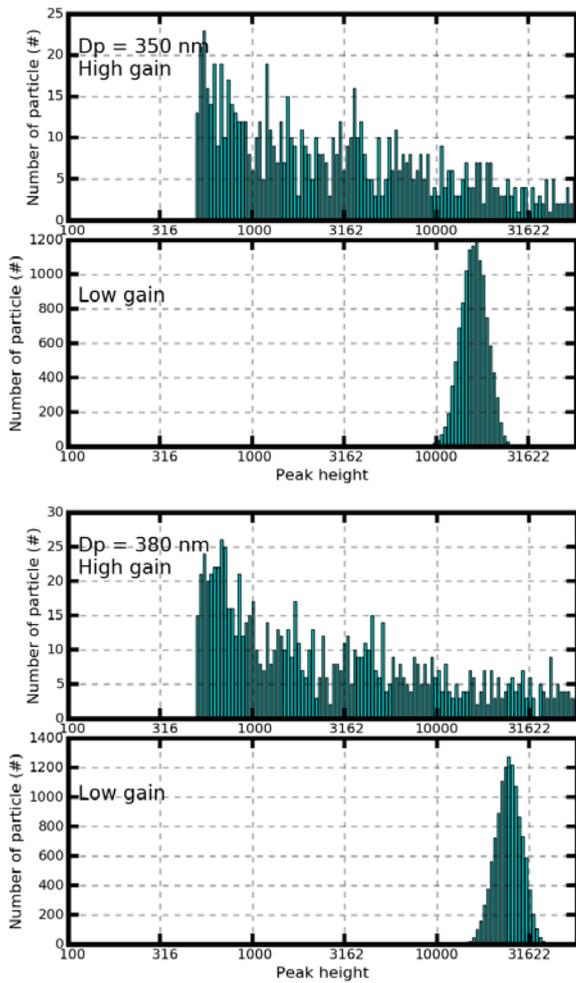
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# 1 The aerosols scattering peak distribution for different diameter



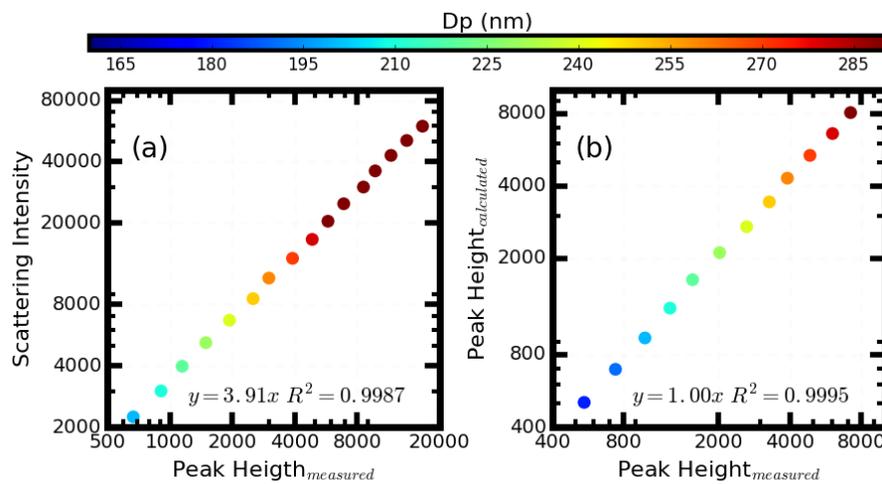






**Figure. S1.** The measured scattering signal distribution at different diameter using the ammonium sulfate.

## 2 Scattering peak height

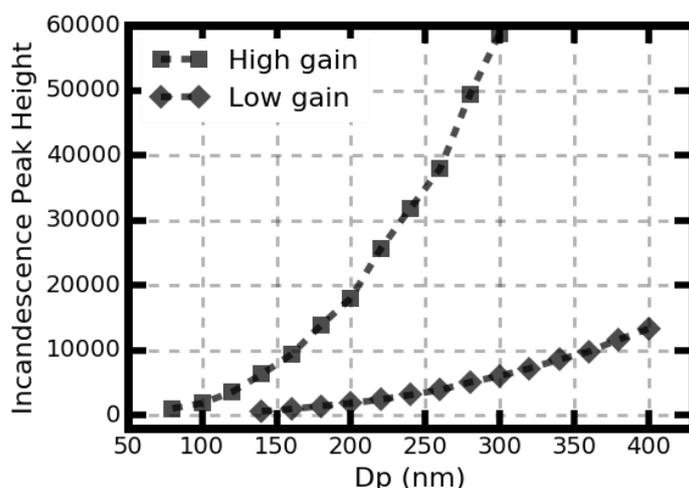


**Figure S2.** (a) the relationship between the scattering peak height from the SP2 low gain scattering channel using the ammonia sulfate and (b) the comparison between the measured scattering peak height from SP2 low gain scattering channel using the ammonia chloride and the calculated scattering peak height using the Mie scattering theory. Different colors represent the results at different diameter.

## 3. Determine the lower threshold of the SP2 for soot particles

For the BC-contained aerosol, Aquadag soot particles with effective density of  $1.8 \text{ g/cm}^3$  is used to

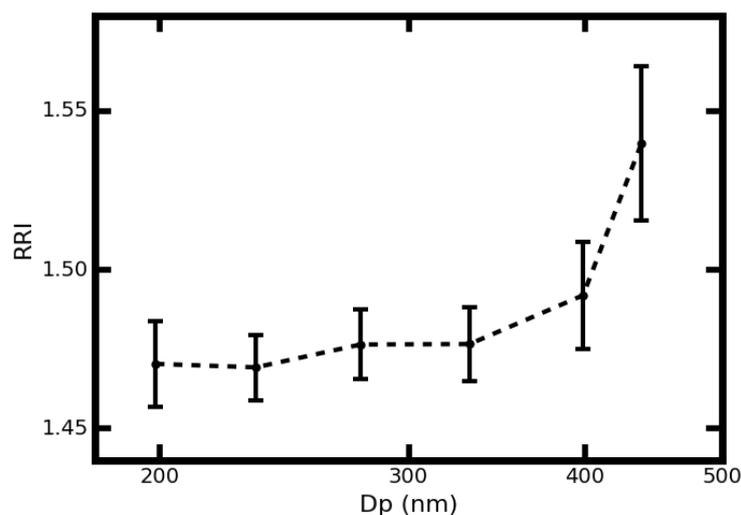
determine the lower limit of the BC particle diameter when the incandescence signals can be detected by SP2. The calibrating procedure is conducted as that of the ammonia sulfate in the manuscript. The diameters ( $D_p$ ) of the aerosol passing through the DMA are manually changed from 60 to 400nm with a step of 20nm. The relationships between the measured incandescence signal height and the  $D_p$  are shown in fig. S3. From fig. S3, we conclude that our SP2 is not capable of measuring the Aquadag soot particles lower than 80 nm.



**Figure S3.** The calibrated relationship between the incandescence peak height and the BC diameter for both the incandescence high gain channel and the incandescence low gain channel.

#### 4 Measured size-resolved RRI at Tiazhou

We made another field measurement on 23 June, 2018, at a suburban site Taizhou (119°57'E, 32°35'N), which lies in the south end of the Jianghuai Plain in the central Eastern China. Fig. R1 gives the corresponding measurement results. From fig. R1, the measured mean RRI varies significantly among different diameter from 1.47 at 198 nm to 1.54 at 450 nm.



**Figure S4.** Measured RRI among different diameters.