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Concurrent measurements of size-segregated particulate sulfate, nitrate and ammonium using quartz fiber filters, glass fiber filters and cellulose membranes

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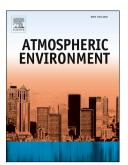
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¹ Concurrent measurements of size-segregated particulate

² sulfate, nitrate and ammonium using quartz fiber filters,

³ glass fiber filters and cellulose membranes

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12 Abstract:

Current science and policy requirements have focused attention on the need to 13 expand and improve particulate matter (PM) sampling methods. To explore how 14 sampling filter type affects artifacts in PM composition measurements, size-resolved 15 particulate SO_4^{2-} , NO_3^{-} and NH_4^{+} (SNA) were measured on quartz fiber filters (QFF), 16 glass fiber filters (GFF) and cellulose membranes (CM) concurrently in an urban area 17 of Beijing on both clean and hazy days. The results showed that SNA concentrations 18 in most of the size fractions exhibited the following patterns on different filters: 19 CM>QFF>GFF for NH₄⁺; GFF>QFF>CM for SO₄²⁻; and GFF>CM >QFF for NO₃⁻. 20 The different patterns in coarse particles were mainly affected by filter acidity, and 21 that in fine particles were mainly affected by hygroscopicity of the filters (especially 22 in size fraction of 0.65-2.1 µm). Filter acidity and hygroscopicity also shifted the 23 peaks of the annual mean size distributions of SNA on QFF from 0.43-0.65 µm on 24 clean days to 0.65-1.1 µm on hazy days. However, this size shift was not as distinct 25 for samples measured with CM and GFF. In addition, relative humidity (RH) and 26 pollution levels are important factors that can enhance particulate size mode shifts of 27 SNA on clean and hazy days. Consequently, the annual mean size distributions of 28 SNA had maxima at 0.65-1.1 µm for QFF samples and 0.43-0.65 µm for GFF and CM 29 samples. Compared with NH_4^+ and SO_4^{2-} , NO_3^- is more sensitive to RH and pollution 30 levels, accordingly, the annual mean size distribution of NO₃⁻ exhibited peak at 31

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