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Secondary inorganic aerosols formation during haze episodes at an urban site in Beijing, China

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2 Beijing, China

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6 **Abstract**

7 Severe PM_{2.5} pollution was observed frequently in Beijing. We conducted highly
8 time-resolved measurements of inorganic ions associated with PM_{2.5} at an urban site
9 in Beijing from 10 February to 19 March, 2015. The average PM_{2.5} mass
10 concentrations during the six haze episodes ranged from 113.0 μg/m³ to 182.6 μg/m³,
11 which were more than 8 times higher than those observed in clean periods. The
12 secondary inorganic species (NH₄⁺, SO₄²⁻ and NO₃⁻) in PM_{2.5} sharply increased
13 during the haze episodes, indicating more extensive formation of SO₄²⁻ and NO₃⁻.
14 The sulfur oxidation ratios (SOR) and the nitrogen oxidation ratios (NOR) in haze
15 episodes were higher than those in clean periods, which indicated that secondary
16 transformation in haze episodes was more significant than those in clean periods. No
17 correlations between SOR and the oxidants (O₃ and HONO) and the temperature were
18 found, whereas a high correlation between SOR and relative humidity (RH) was
19 found in haze episodes, which implied that sulfate was mainly produced by the
20 aqueous-phase oxidation of SO₂ rather than the gas-phase conversion of SO₂ to sulfate.
21 The conversion of SO₂ to SO₄²⁻ was observed to be sensitive to changes in RH.
22 Furthermore, the SOR sharply increased at RH > 60% with the highest value of 0.88
23 at RH around 80% during complicated pollution. NO₂ played an important role in the

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