

1 **Supplementary Information (SI)**

2 **Characterization of Atmospheric PM_{2.5} Inorganic**
3 **Aerosols Using the Semi-Continuous PPWD-PILS-IC**
4 **System and the ISORROPIA-II**

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13 Section S1: The Preparation of the 5 L/min Porous Metal Denuder (PDS)

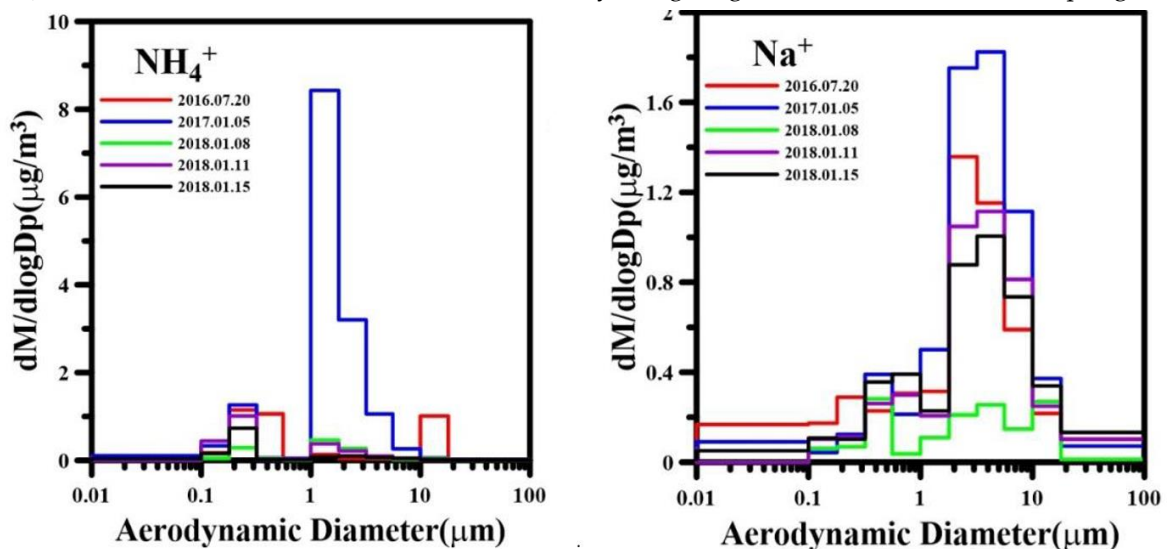
14 The 5 L/min PDS is used to sample precursor gases and water-soluble inorganic ions (WSII)
 15 manually. Two PDSs are used, each of which is prepared for the next sampling day while another
 16 one is sampling. Before sampling, two porous metal discs (PMD) and three filters of the PDS need to
 17 be prepared with the following procedures.

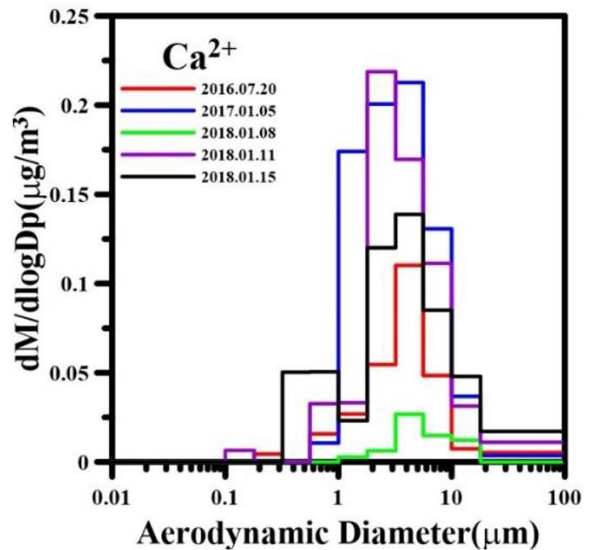
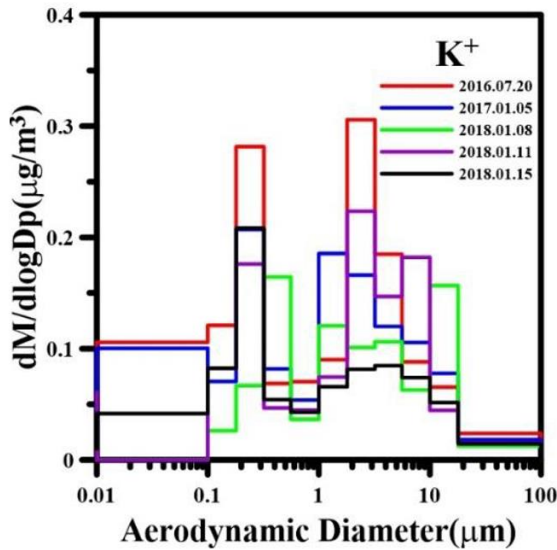
18 Preparation of Porous Metal Discs

19 To sample precursor gases with a good sampling accuracy, the PMDs need to be cleaned
 20 carefully before re-use after every sampling day. The PMDs are firstly soaked and cleaned with dilute
 21 detergent under the vacuum condition (0.2 atm) and ultrasonicated for 30 min. The PMDs are then
 22 soaked and cleaned with deionized (DI) water under the same vacuum condition and ultrasonicated
 23 for 15 min. This step is repeated 4-5 times to minimize the background effect. After washing, the
 24 PMDs are dried in the oven at 50 °C in 3 hours. The dried and cleaned PMDs are stored in sealed
 25 bottles for the next sampling day. Before sampling, one dried and cleaned PMD is coated with 1%
 26 w/v carbonate/glycerin and another one is coated with 1% nitric acid in methanol/water solution
 27 under the vacuum condition (0.2 atm) and ultrasonicated for 30 min. Two coated PMDs are then
 28 dried by using N₂ gas for 15-20 min. Finally, the cleaned and coated PMDs are ready for use.

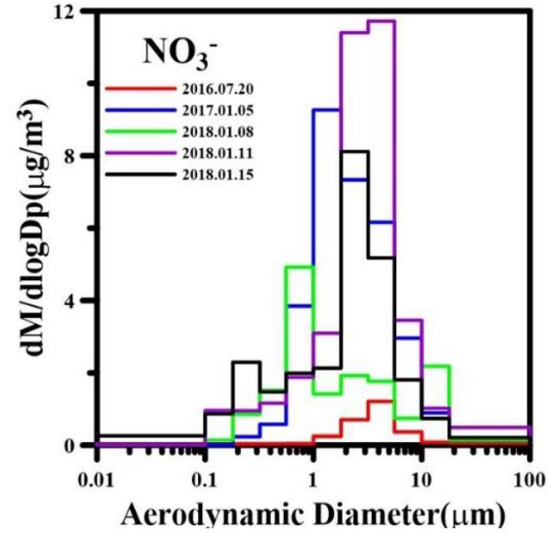
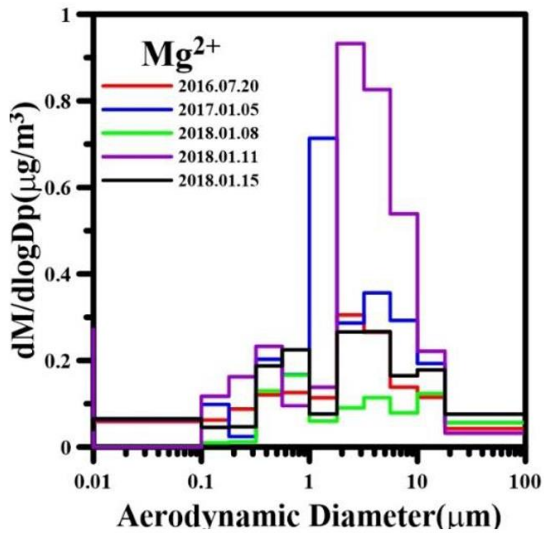
29 Preparation of Filters

30 47. -mm Teflon (Teflo R2PJ047, Pall Corp., New York, USA), and 47-mm Nylon (Nylasorb
 31 Membrane 66509, Pall Corp., New York, USA) and 47-mm Quartz (Tissuquartz 2500 QAT-UP
 32 37mm,47mm, Pall Corp., New York, USA) filters are used in the PDS for sampling non-volatile and
 33 semi-volatile species in PM_{2.5}, respectively. Only the Quartz filter needs to be prepared before
 34 sampling. The Quartz filter is coated with 500 μL, 1% acid nitric under the vacuum condition (0.2
 35 atm) and ultrasonicated for 30 min and then dried by using N₂ gas for 15-20 min before sampling.

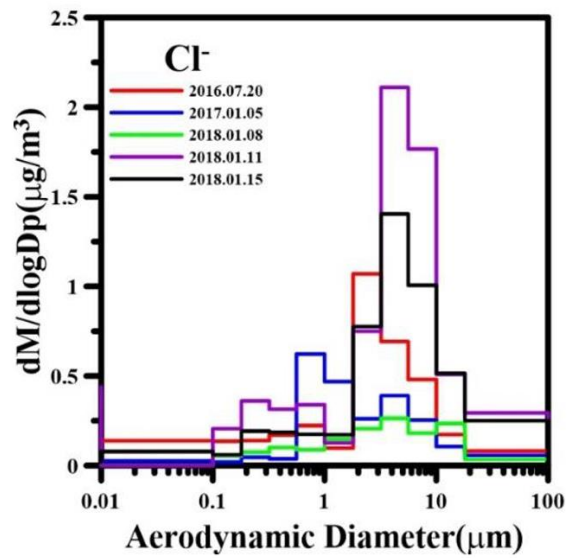
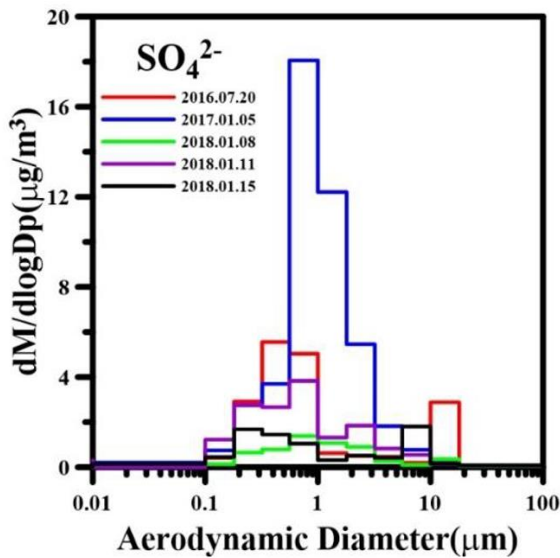




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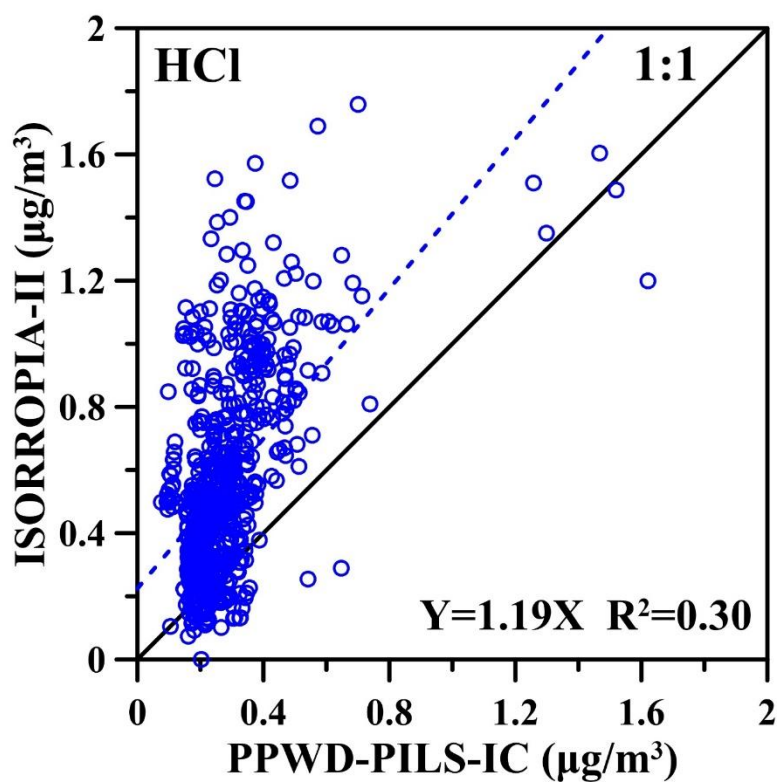
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Figure S1. The size distribution of the water-soluble inorganic ions (NH_4^+ , Na^+ , Ca^{2+} , Mg^{2+} , NO_3^- , SO_4^{2-} and Cl^-) sampled by NCTU micro-orifice cascade impactor (NMCI) at National Chiao Tung University (NCTU) site from July, 2016 to Jan, 2018.

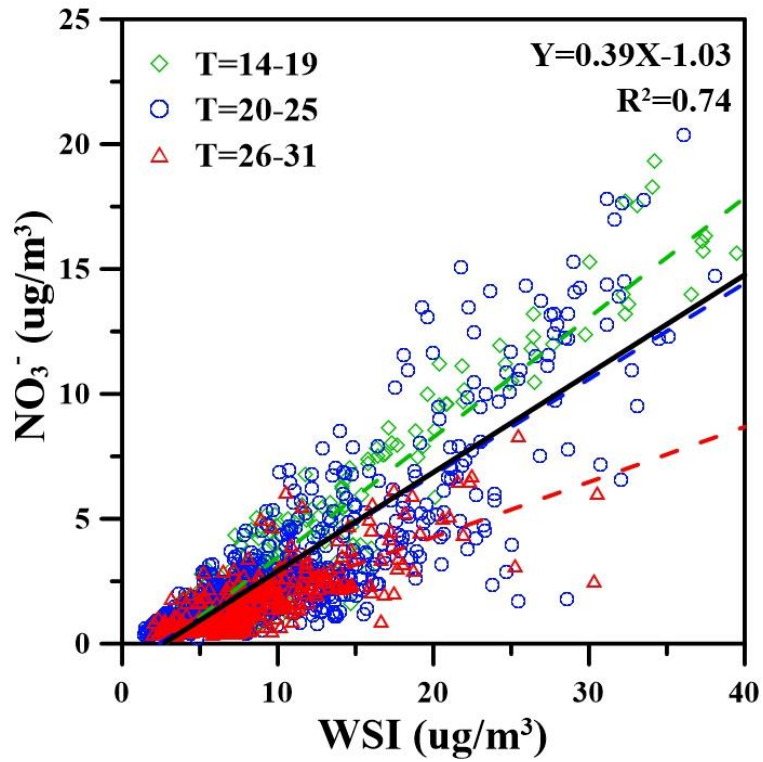


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Figure S2. Comparison of the prediction and the observation for HCl.

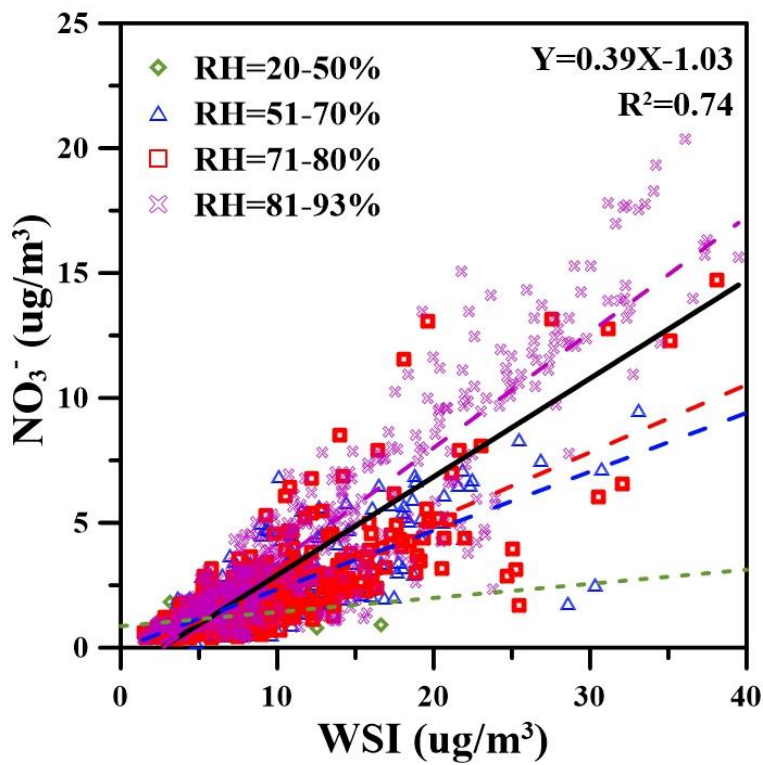
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(a)



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(b)

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Figure S3. Correlation of NO_3^- and water-soluble inorganic ions at different temperature (T) and relative humidity (RH) ranges.

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