Supplementary for

Mixing state of refractory black carbon at different atmospheres in China

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1 Measurement site.

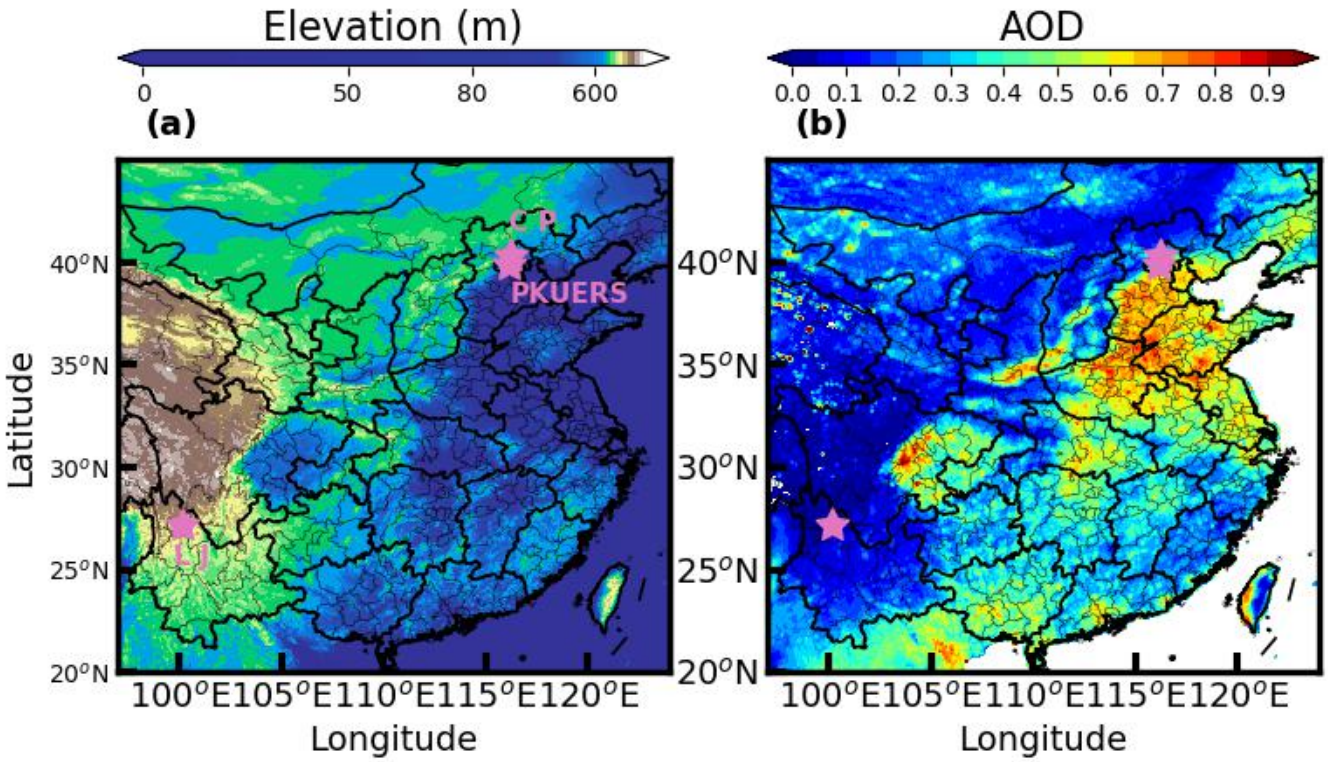

Figure S1: Measurement site of PKUERS, CP, and LJ (marked with stars). Filled colors represent (a) the topography of the Jianghuai Plain. (b) the average aerosol optical depth at 550nm during the year of 2020 from Moderate Resolution Imaging Spectroradiometer onboard satellite Aqua.

2 Instrument setup

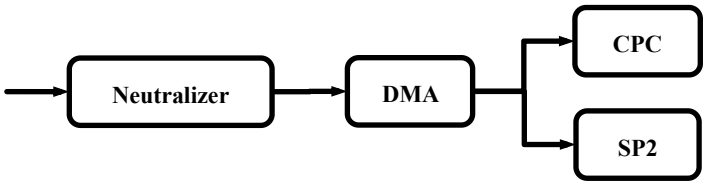

Figure S2. Schematic of the instrument setup for measuring the ambient aerosol RRI.

3 Overview of the measurement results for the PKU site.

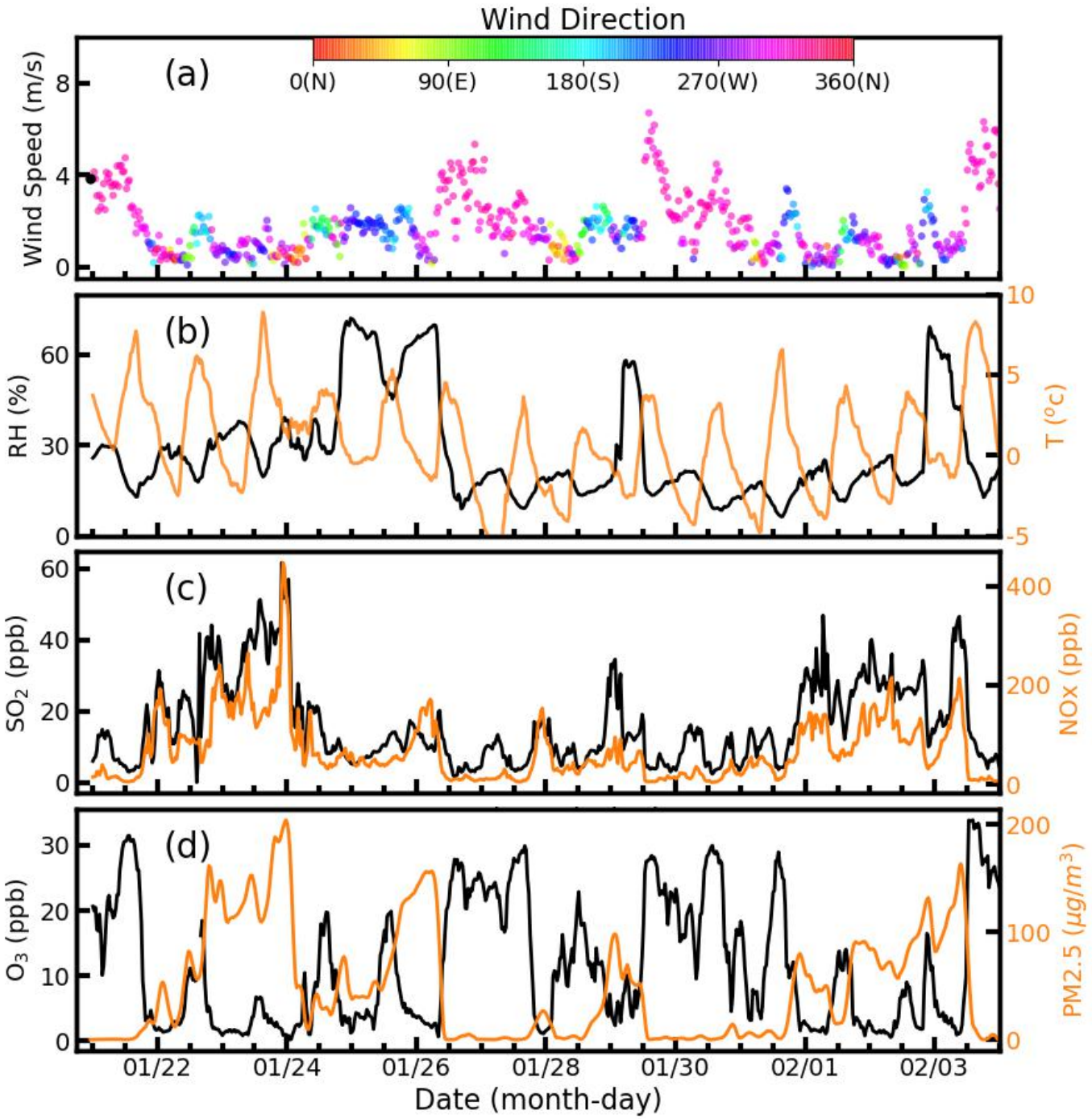

Figure. S3. The time series of (a) wind speed, (b) RH (in black), and T (in orange), (c) chemical compositions of organic compositions (green), nitrate (blue), sulfate (red), ammonium (orange), and chlorine (purple), (d) SO_2 (black) and NOx (orange), and (3) O_3 (black) and $PM_{2.5}$ (orange) during the measurement conducted at PKU. The filled colors in the panel (a) represent the wind directions.

4 Overview of the measurement results for the CP site.

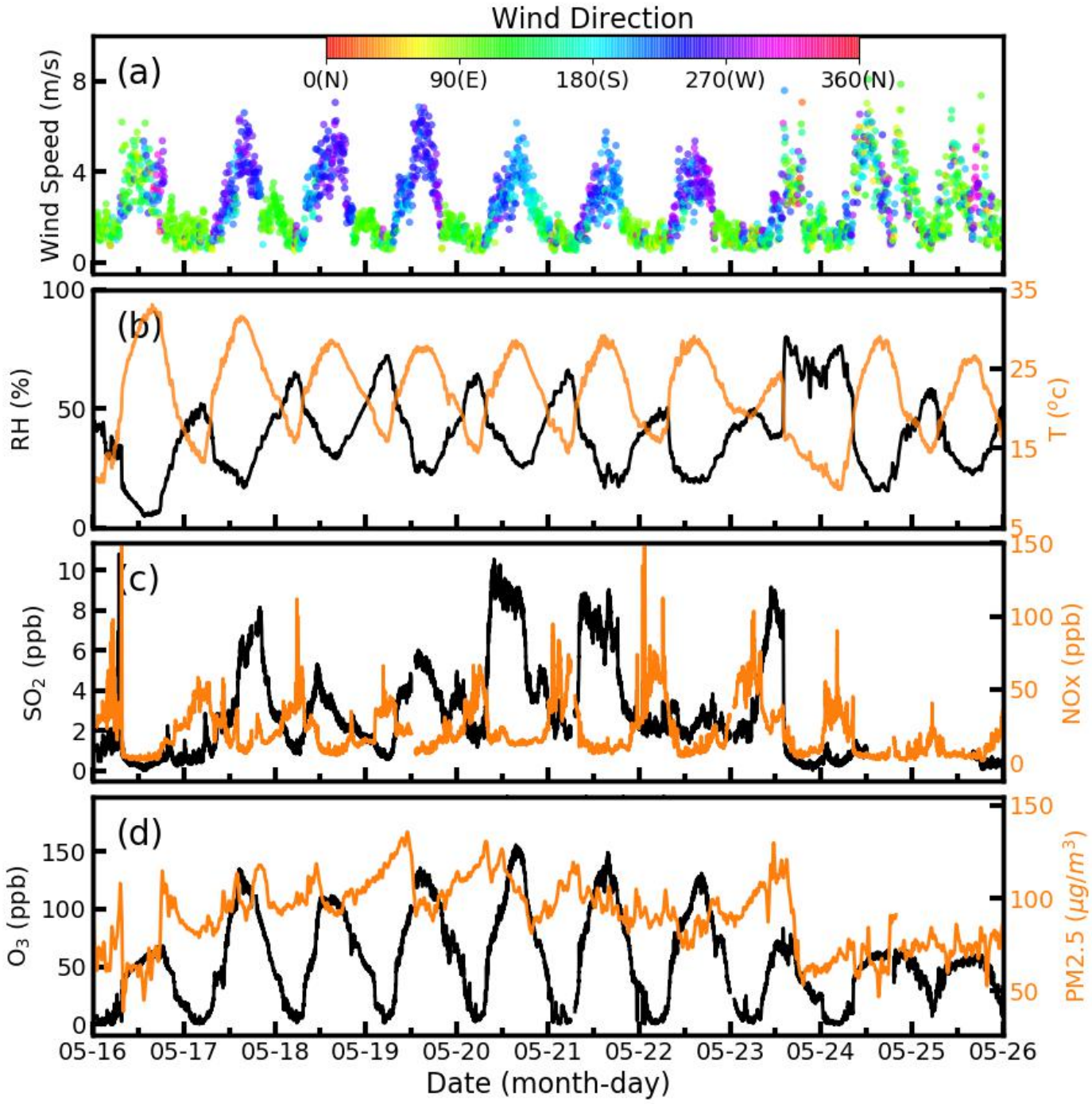

Figure. S4. The time series of (a) the wind speed, (b) RH (in black), and T (in orange), (c) chemical compositions of organic compositions (green), nitrate (blue), sulfate (red), ammonium (orange), and chlorine (purple), (d) SO_2 (black) and NOx (orange), and (3) O3 (black) and $PM_{2.5}$ (orange) during the measurement conducted at CP. The filled colors in the panel (a) represent the wind directions.

5 Overview of the measurement results for the LJ site.

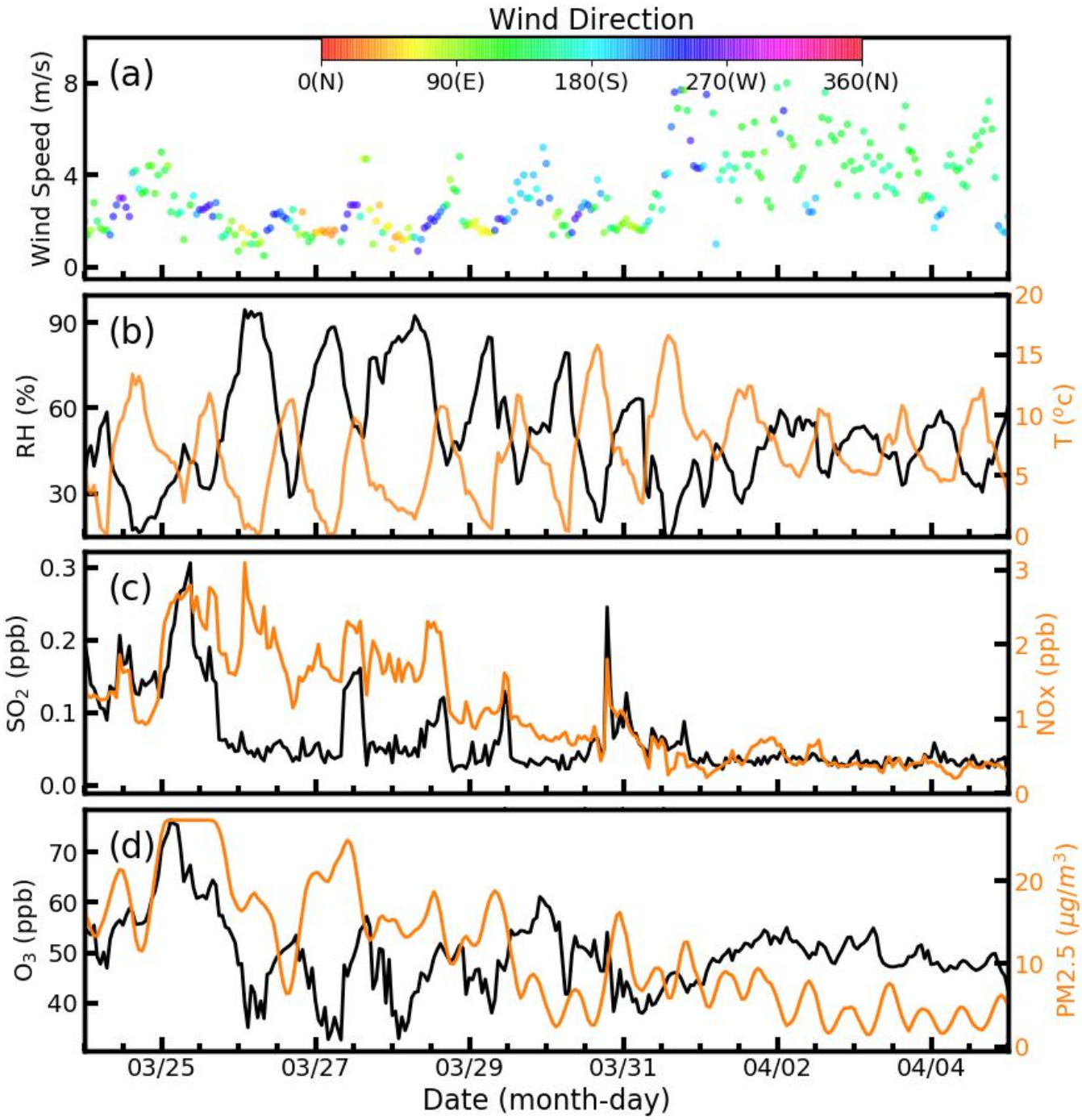

Figure. S5. The time series of (a) wind speed, (b) RH (in black), and T (in orange), (c) chemical compositions of organic compositions (green), nitrate (blue), sulfate (red), ammonium (orange), and chlorine (purple), (d) SO_2 (black) and NOx (orange), and (3) O3 (black) and $PM_{2.5}$ (orange) during the measurement conducted at LJ. The filled colors in the panel (a) represent the wind directions.

6 Comparison between the number concentrations of BC and mass concentration of the OA.

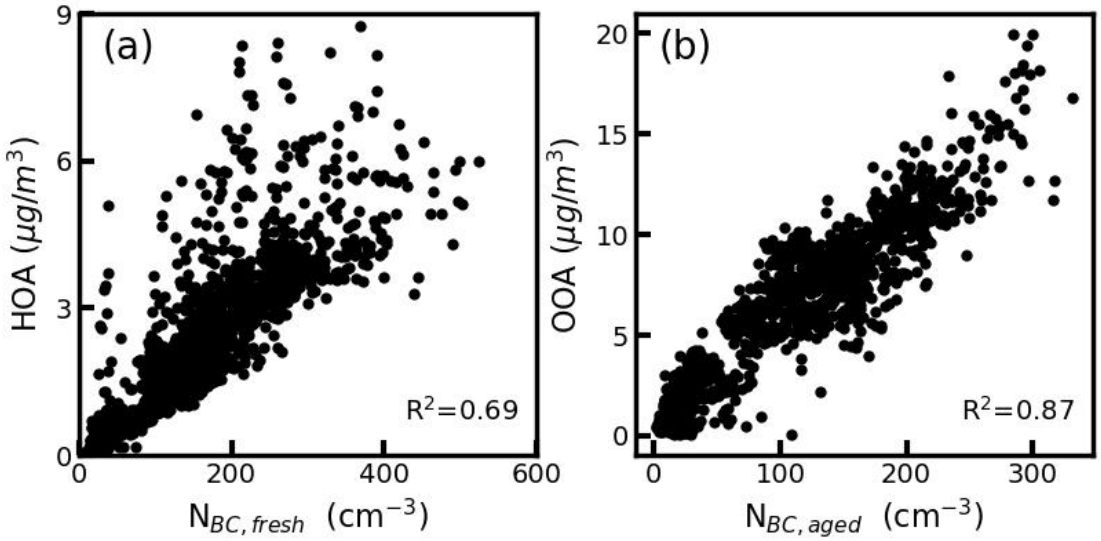

Fig. S6. Comparison between (a) the number concentrations of the fresh BC and the mass concentrations of HOA, and (b) the number concentrations of the aged BC and the mass concentrations of OOA.