

1 **Supplementary information**

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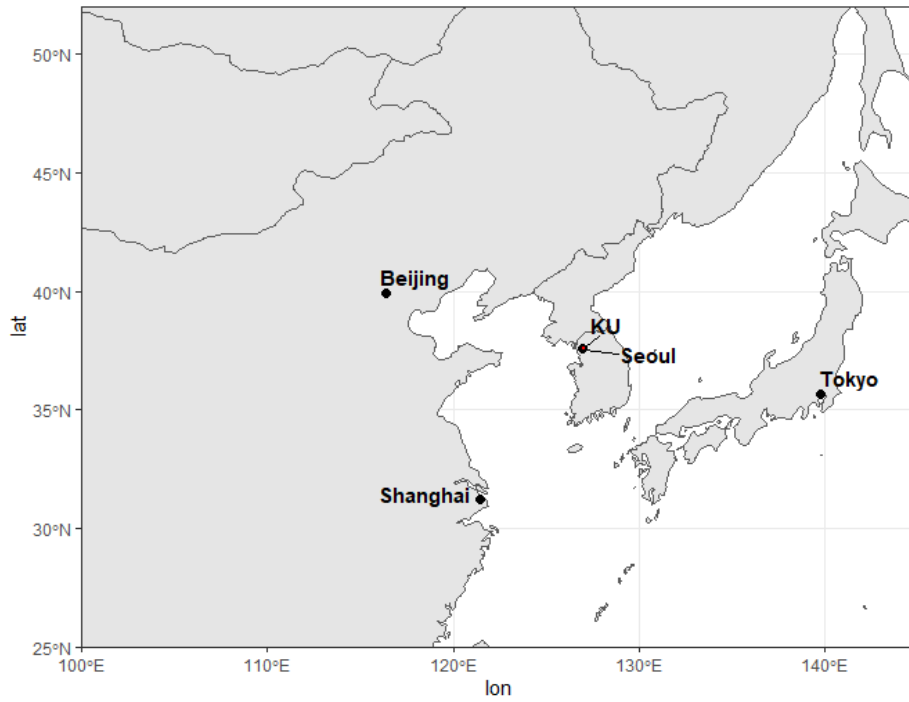
3 Table S1. The number of stable isotope ratios.

Period (year-month)	Number
18-May	2
18-Jun	3
18-Jul	6
18-Aug	2
18-Dec	2
19-Jan	5
19-Feb	5
19-Mar	6

Total number	31
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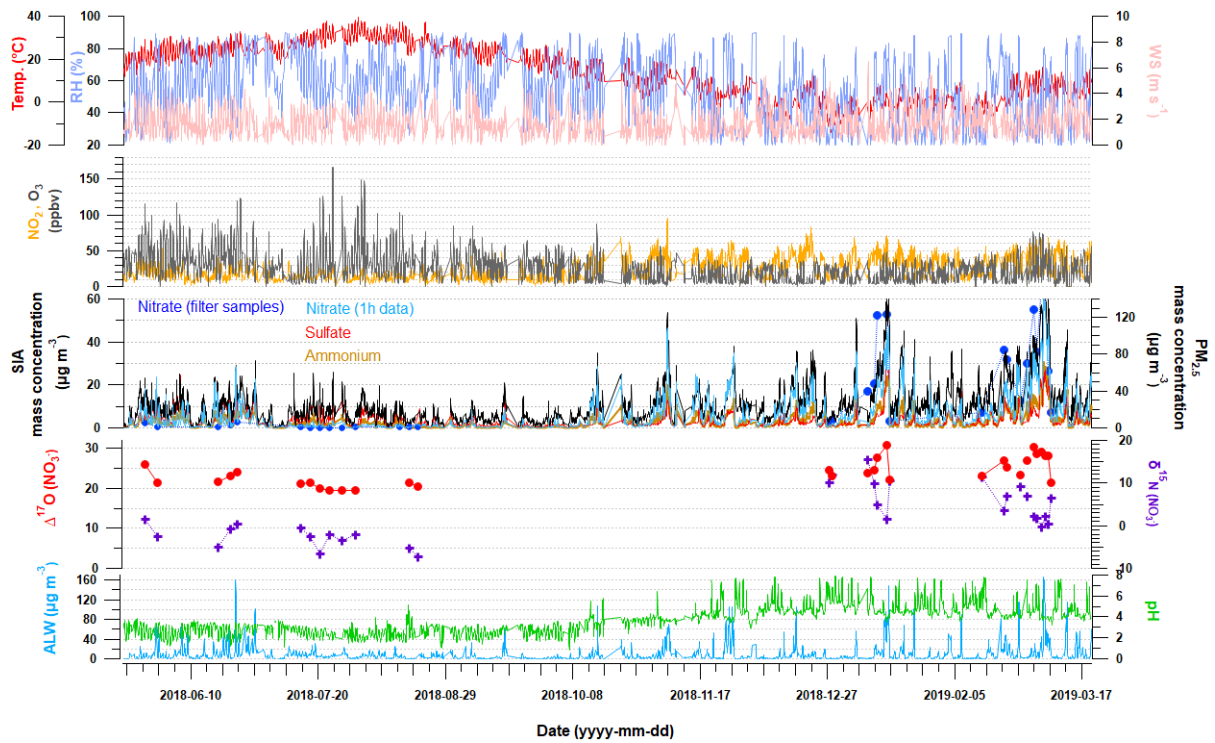
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7 Figure S1. Location of PM_{2.5} aerosol sampling site (KU denotes Korea University).

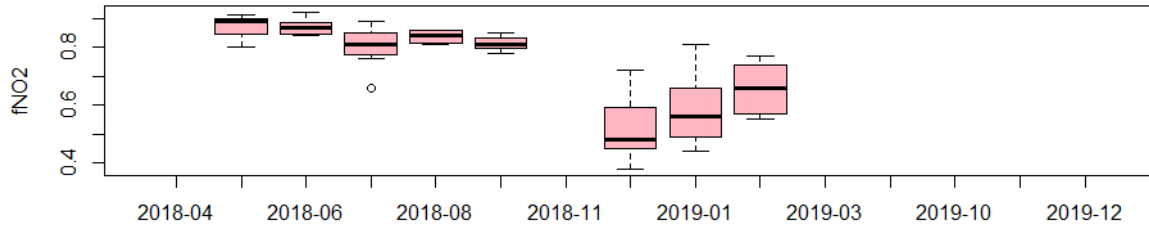
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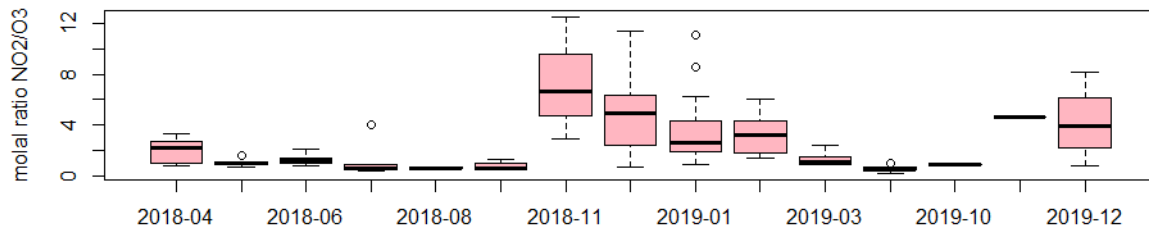
10 Figure S2. Time-series of measured parameters, including meteorological parameters (air temperature,
11 relative humidity, and wind speed), gaseous precursors (NO_2 and O_3), $\text{PM}_{2.5}$ mass and SIA
12 (NO_3^- , SO_4^{2-} , and NH_4^+) concentrations, triple oxygen and nitrogen stable isotope ratios,
13 and calculated ALW content and aerosol pH. All is 1h-averaged data, except stable isotope
14 ratios and NO_3^- concentration, which are filter-based measurements.
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16 a)



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18 b)

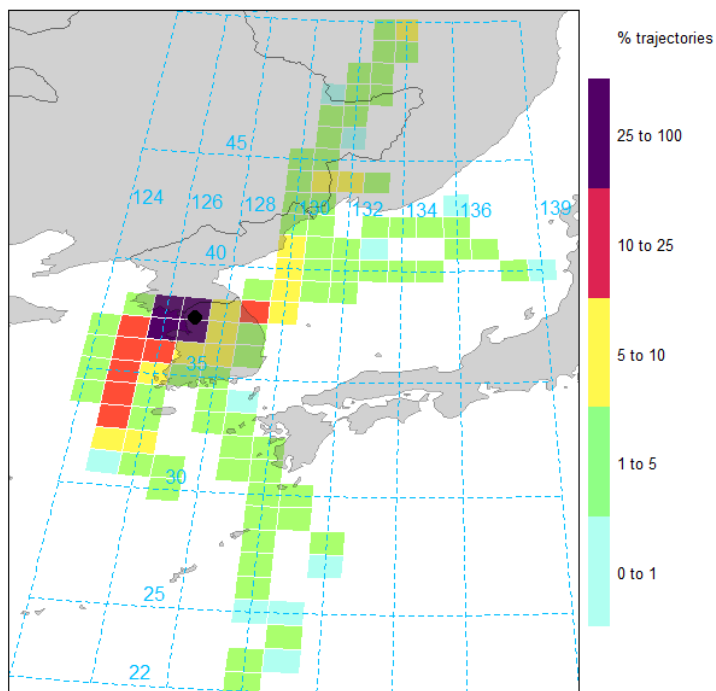


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20 Figure S3. Monthly box plot of (a) f_{NO_2} and (b) molar ratio of NO₂/O₃ for the periods of April –
21 September 2018, November 2018 – April 2019, and October – December 2019. Note that
22 nitrogen and oxygen isotope data is available for May-August 2018 and December 2018-
23 March 2019.

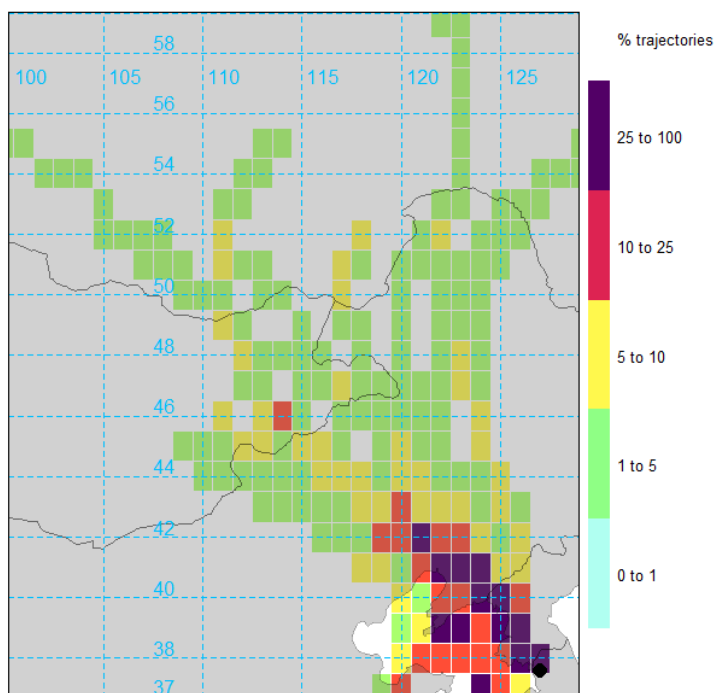
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25 a)



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27 b)

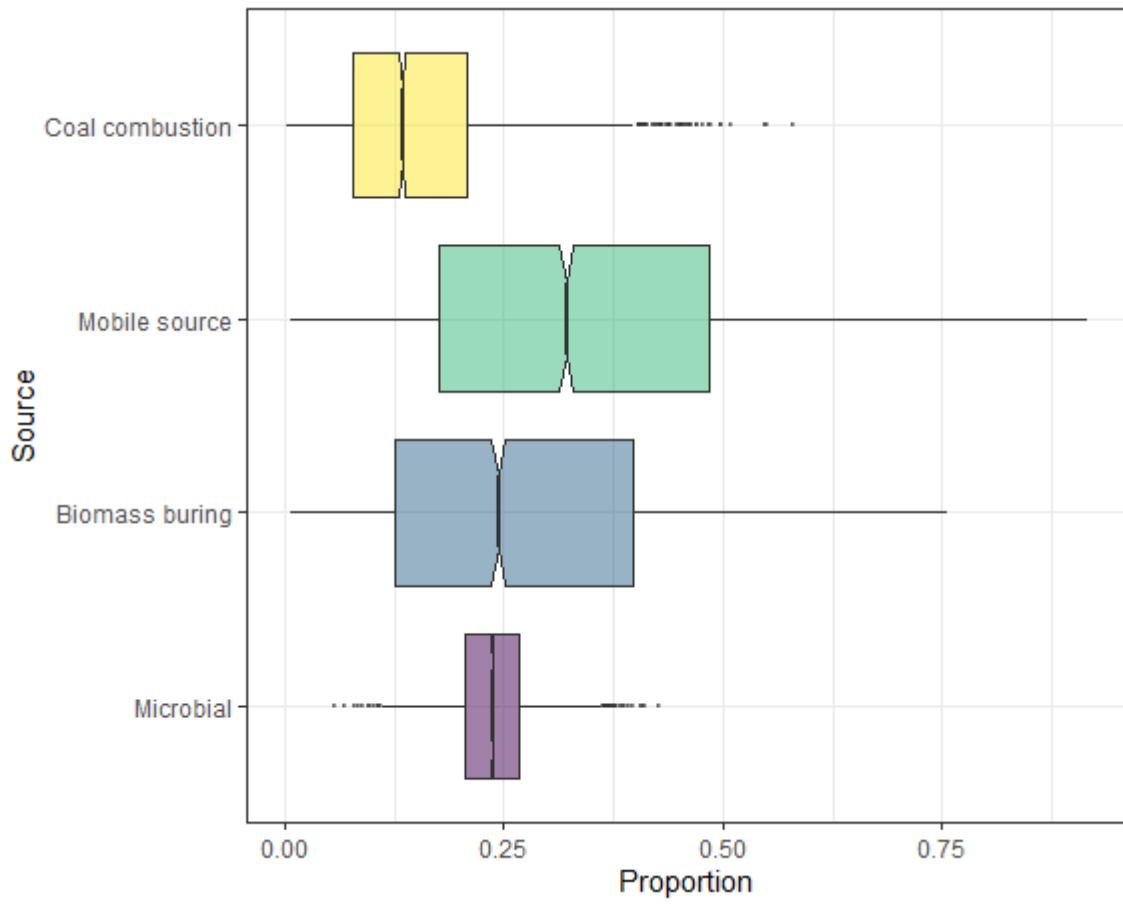


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29 Figure S4. Frequency of air mass backward trajectories with (a) $\delta^{15}\text{N}(\text{NO}_3^-)$ lower than 20th percentile
30 and (b) $\delta^{15}\text{N}(\text{NO}_3^-)$ higher than 80th percentile.

31 a)

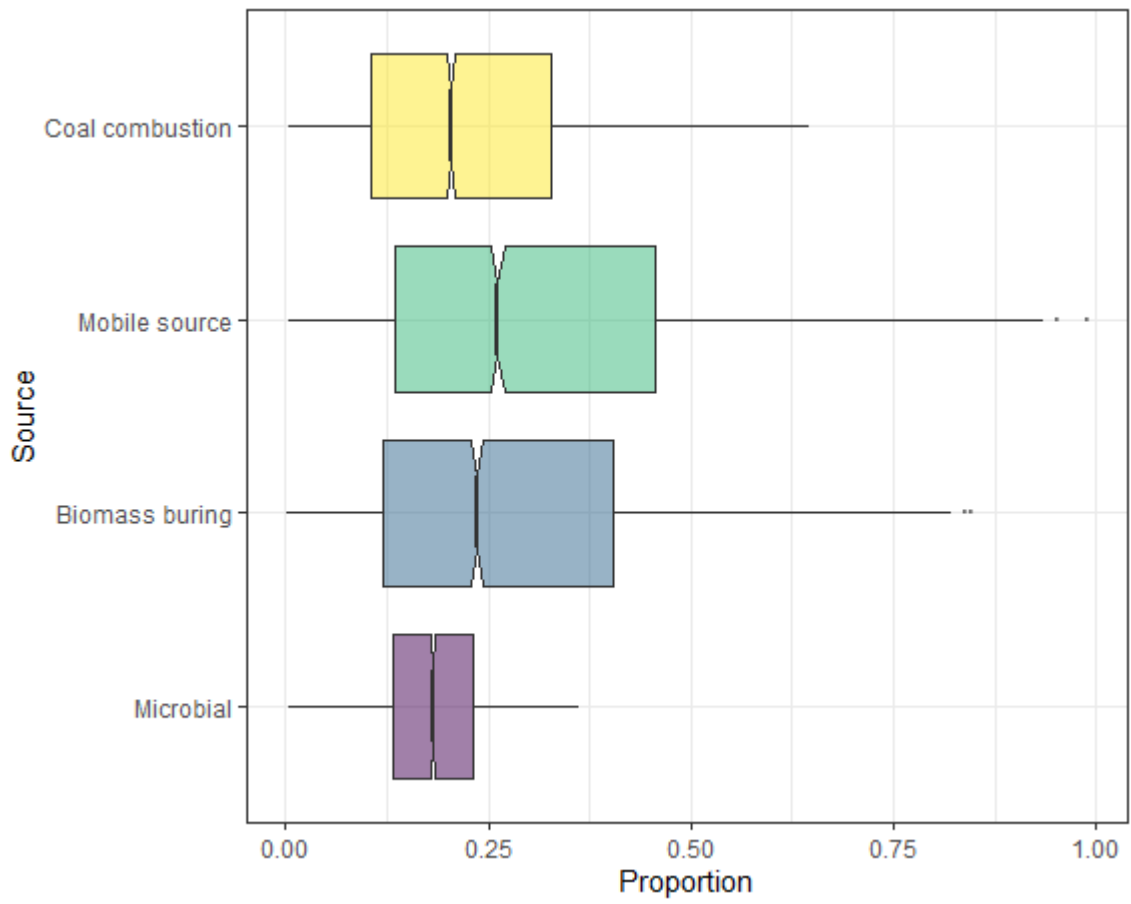
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35 b)
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38 Figure S5. Histogram of proportional contribution for each emission source. (a) summer, (b) winter.
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