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The vertical variability of ammonia in urban Beijing, China

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Table S1. Threshold values (75th percentile, μg m^{-3}) for the WPSCF of NH_3 and NH_3 + NH_4^+ during four seasons.

	Height (m)	Spring	Summer	Autumn	Winter
NH_3	2	14.4	17.9	10.8	9.9
	63	16.6	21.1	13.4	11.0
	180	15.9	20.9	13.0	8.8
	320	13.4	19.0	10.3	7.0
NH_3+NH_4^+	2	30.2	22.6	20.7	18.8
	63	33.3	27.0	24.9	20.9
	180	34.2	26.8	21.9	16.8
	320	28.8	24.4	17.9	16.4

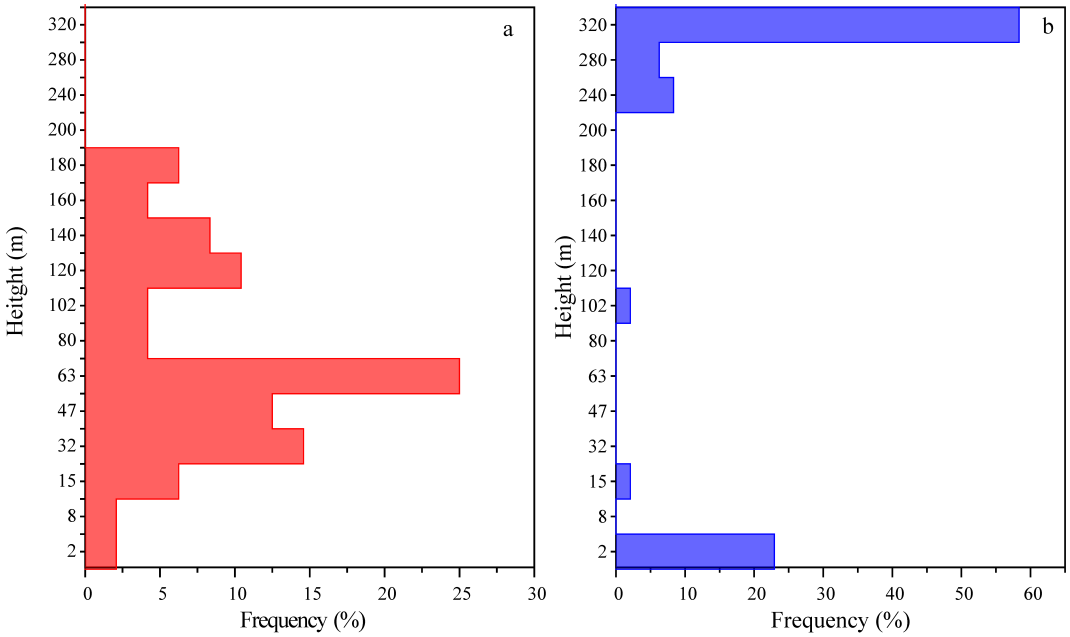


Fig. S1 The frequency distribution of the maximum (a) and minimum (b) values of weekly NH_3 concentrations for all heights.

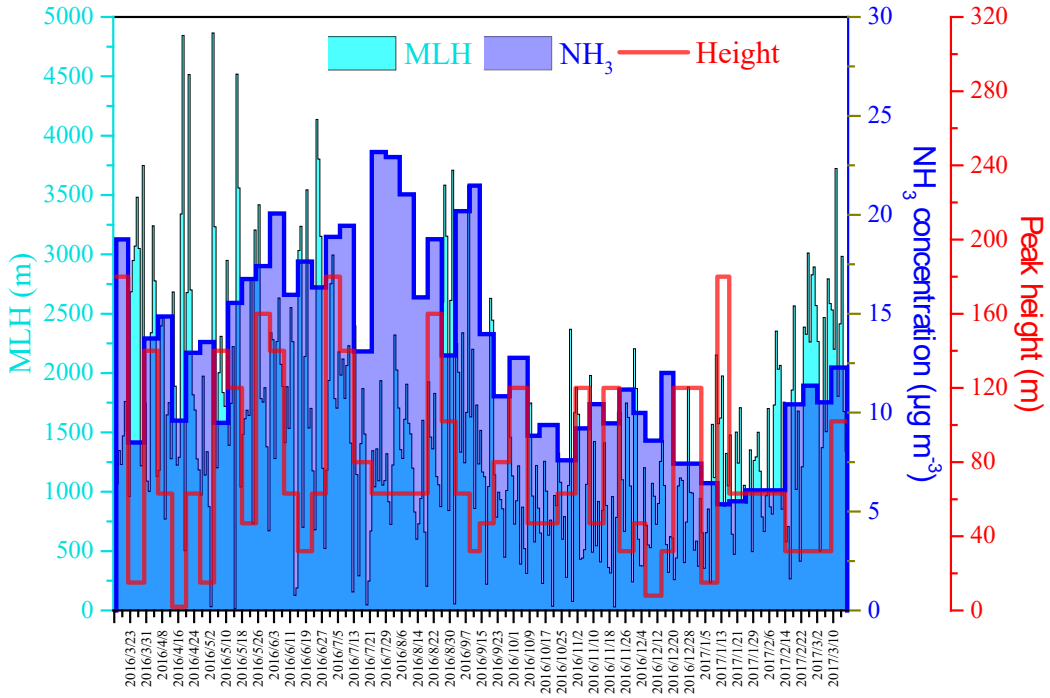


Fig. S2 Weekly mixed-layer height (MLH), average weekly NH_3 concentration of all heights and the height with peak NH_3 concentration.

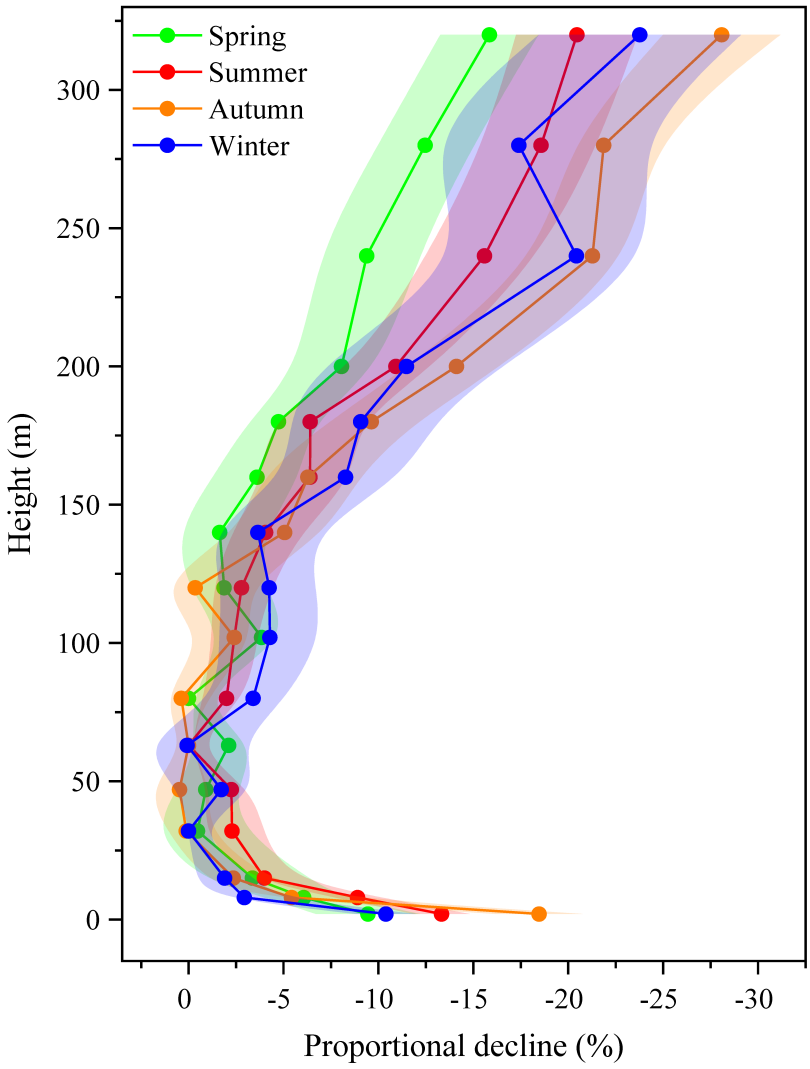
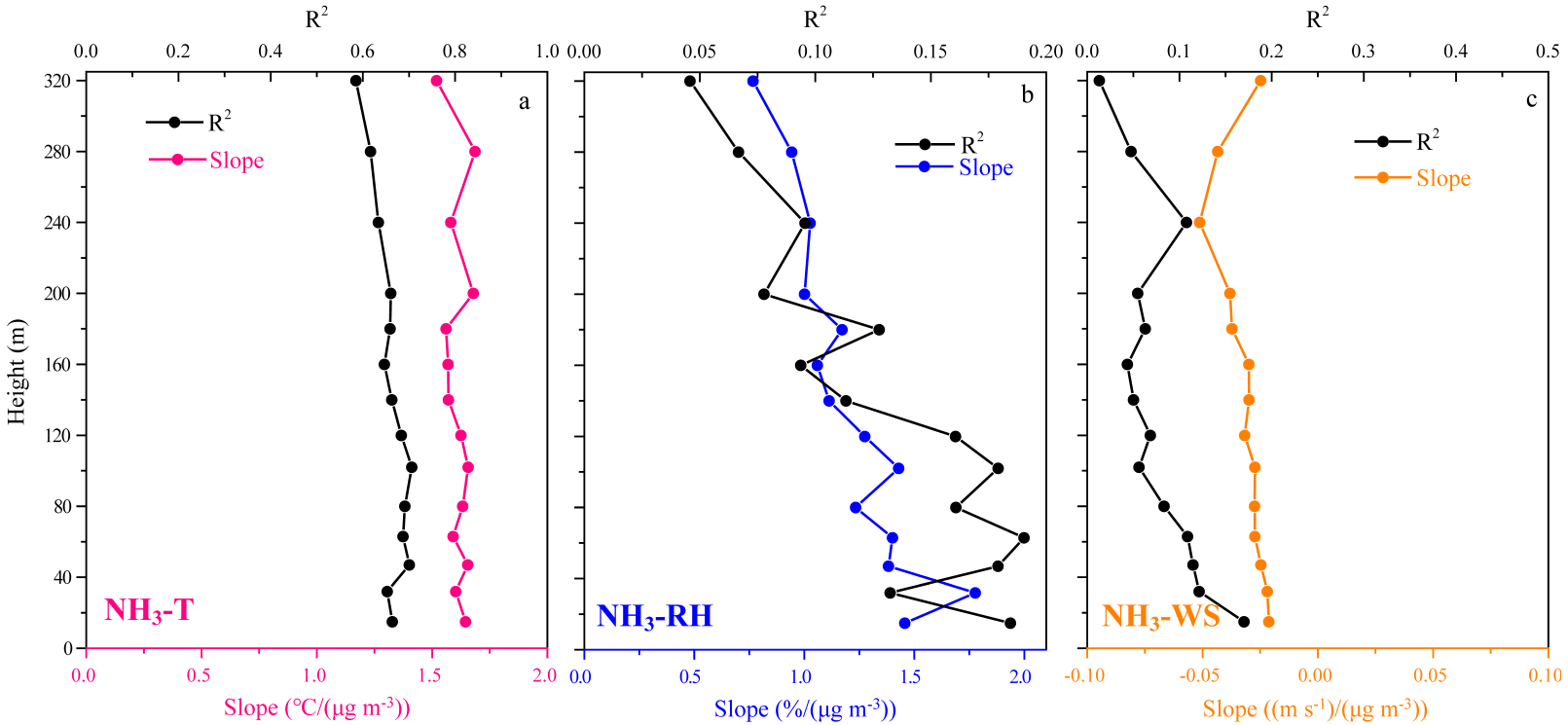


Fig. S3 Decline proportion of NH_3 concentration from the height with maximum to the upper and lower profiles in four seasons.



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20 **Fig. S4 The coefficient of determination (R^2) and slope between NH_3 concentration and temperatures (T) (a), relative humidity (RH) (b),**

21 **wind speed (WS) (c) for each height.**

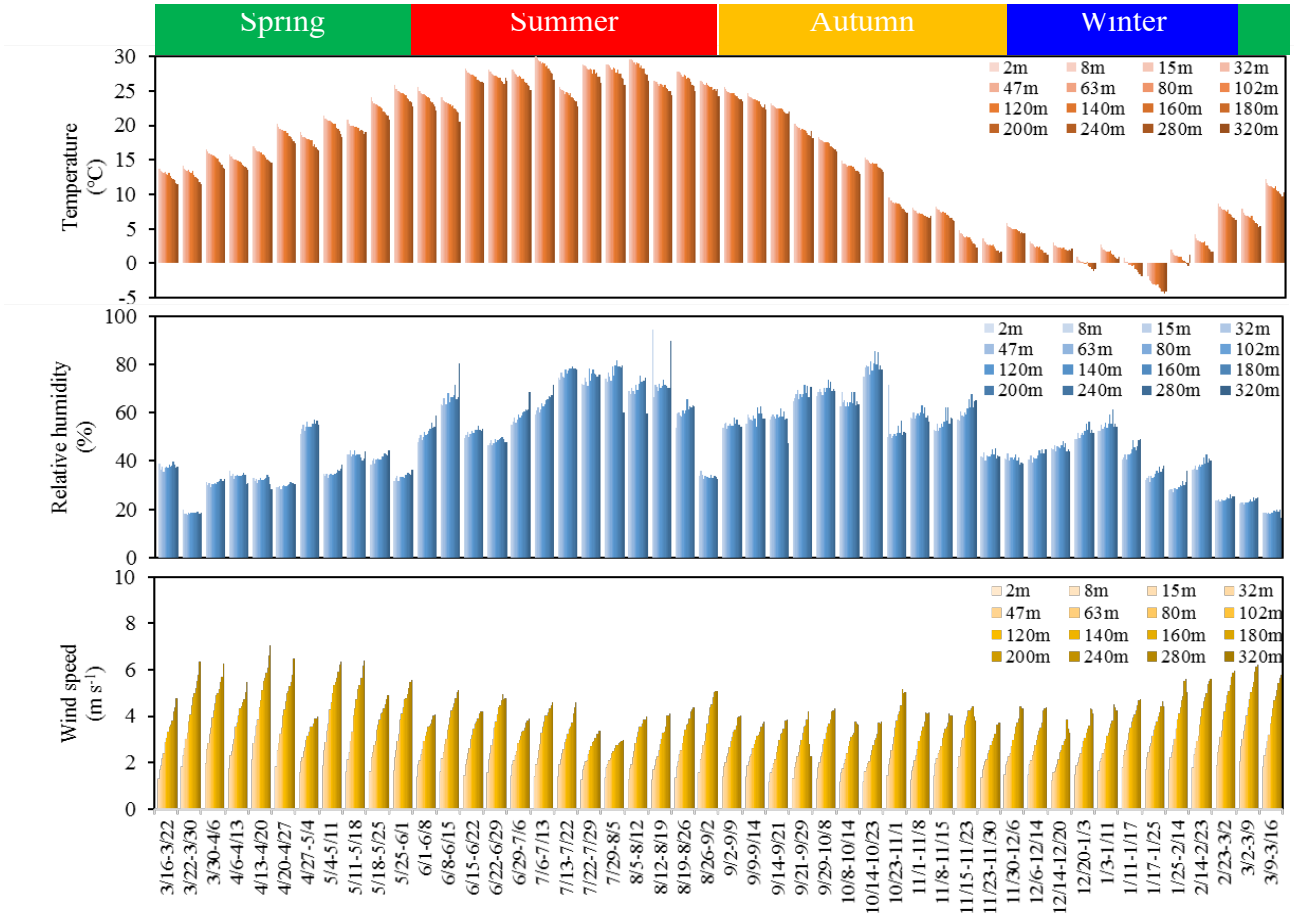

Fig. S5 Time series of vertical distribution of weekly temperature (top), relative humidity (middle) and wind speed (bottom) in Beijing urban (03/16/2016 - 03/16/2017).

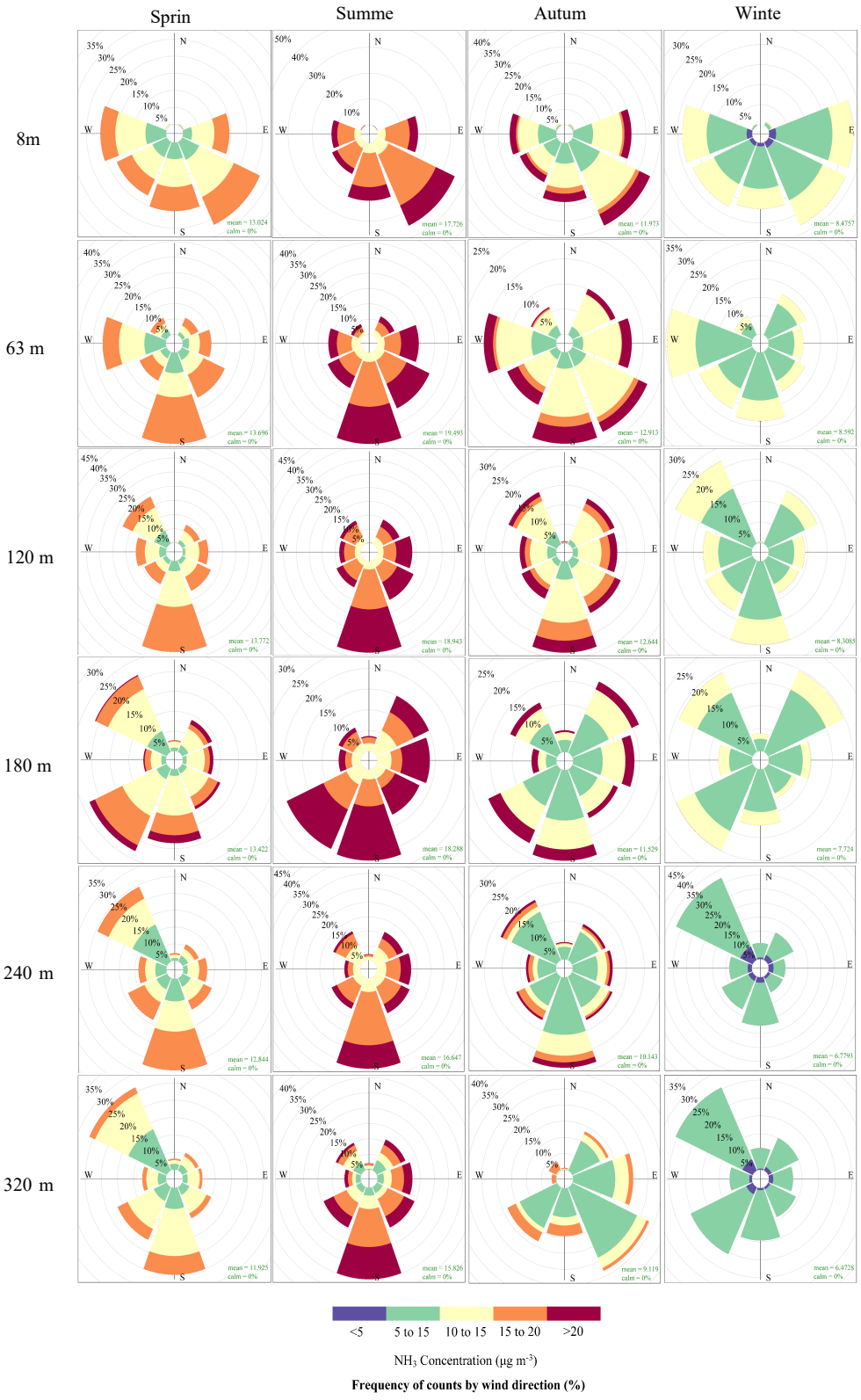

Fig. S6 Wind roses of selected 6 heights colored by NH_3 concentrations (μg m^{-3}) during four seasons, i.e., Spring, Summer, Autumn, and Winter from left to right, respectively. The length of each wedge represents the wind frequency of each direction.

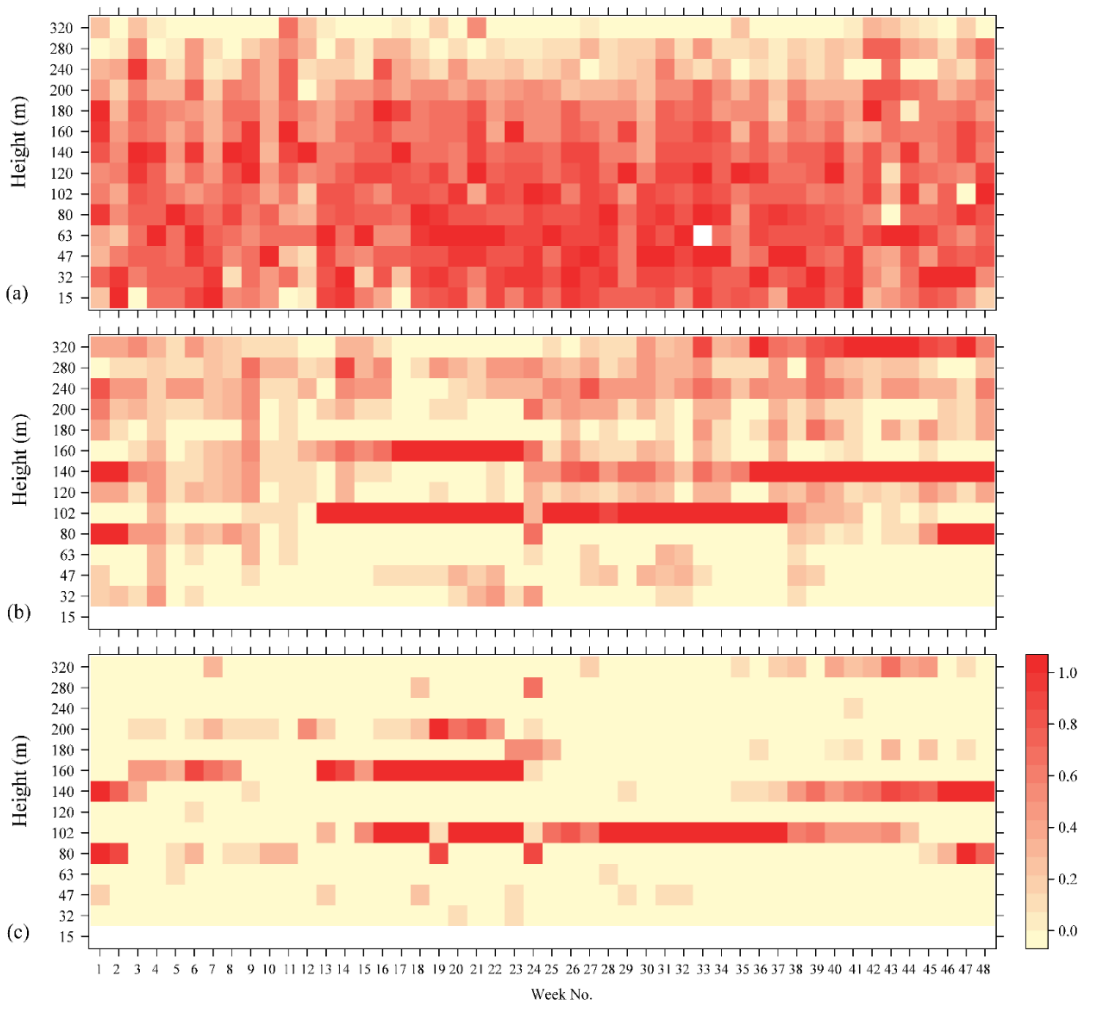

Fig. S7 Time series of weekly relative NH_3 concentration fraction* (a) and weekly thermal inversion layer probability* (b: 6 a.m., c: 3 p.m.) for all heights.

*Weekly relative NH_3 concentration fraction was calculated by weekly NH_3 concentration for a specified height minus min NH_3 concentration in the same week, then divided by the difference between the max and min NH_3 concentrations for the same week. The fraction is between 0 to 1, where '0' represents the min NH_3 concentration and '1' means max NH_3 concentration.

*Weekly thermal inversion layer probability was calculated by the number of the days when thermal inversion layer occurred for a specified height was divided by the total number of the days during one sampling period (generally 7 days).

*Week No. represents the weekly sampling period, same as the time series along x axle in Fig. 2.

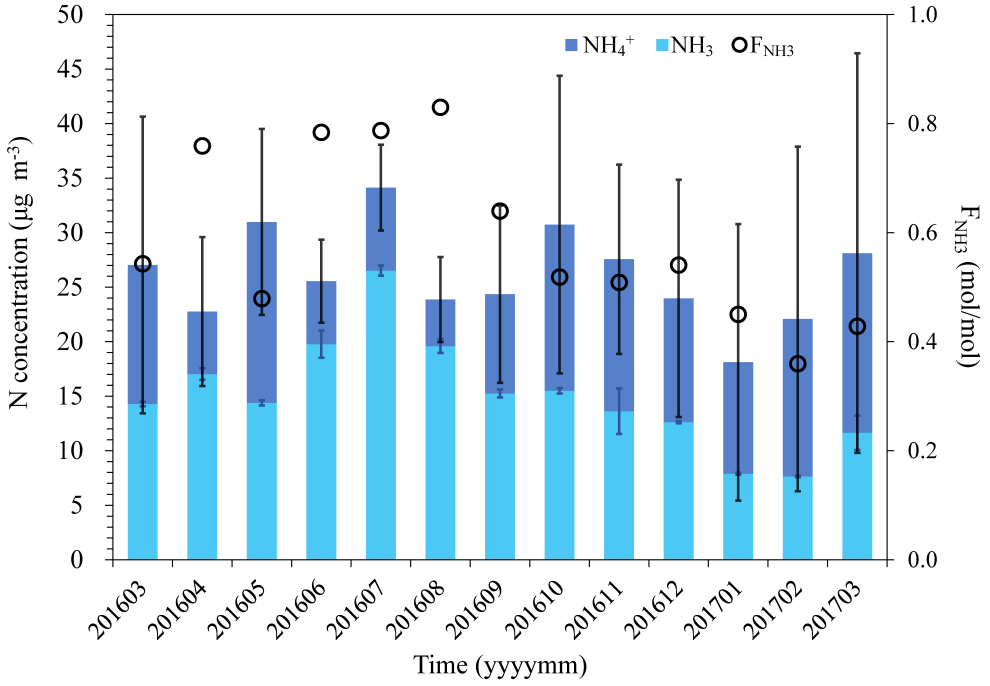

Fig. S8 Monthly concentrations (±1σ) of particulate NH_4^+ ($NH_4^+{}_{(p)}$) and gaseous NH_3 ($NH_{3(g)}$) in air (µg m^{-3}), and ammonia conversion ratio (F_{NHx}, mol/mol)

*F_{NHx} = gaseous NH_3 concentration divided by the sum of the gaseous NH_3 and particulate NH_4^+ concentrations, where the concentrations are in molar units.

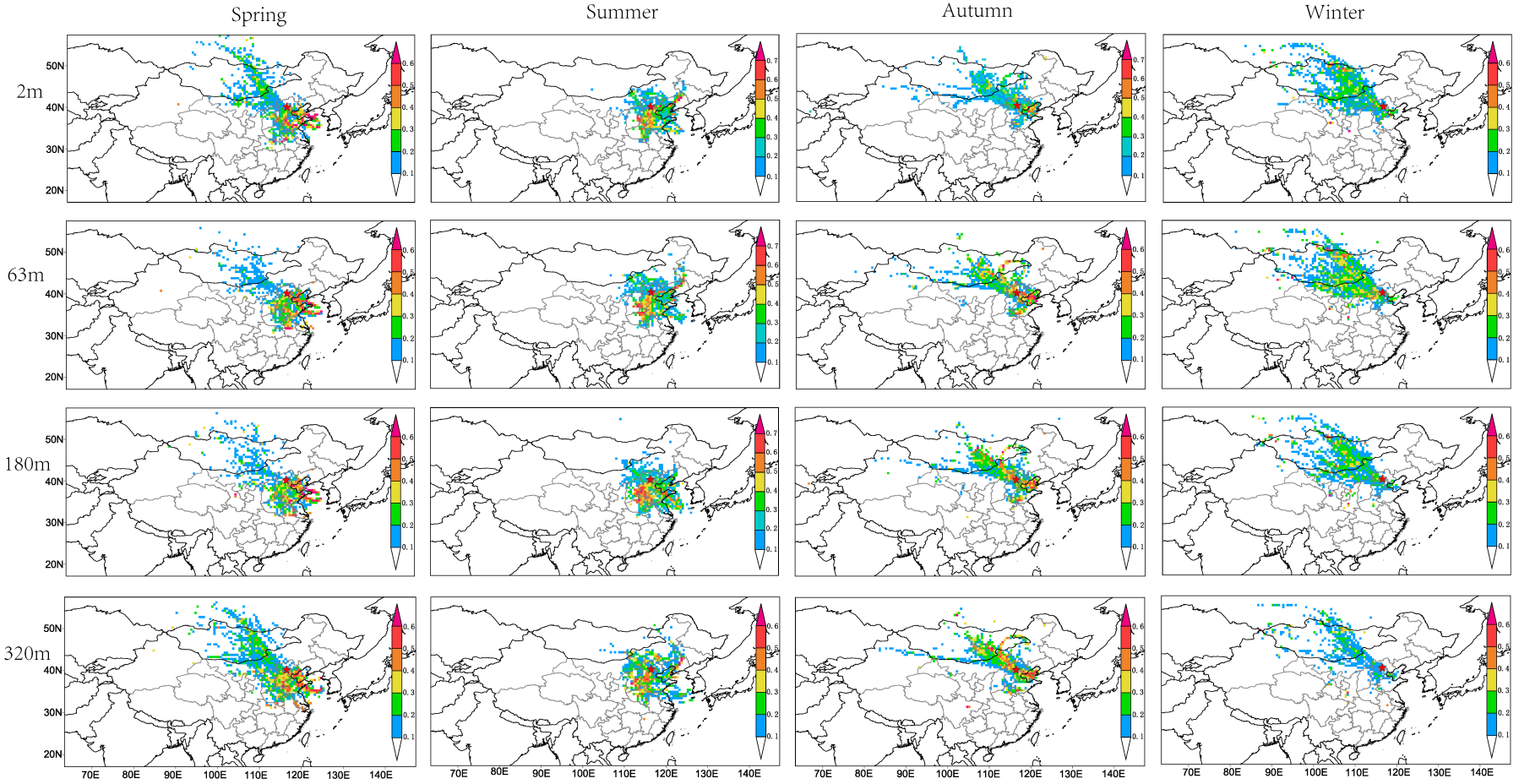

Fig. S9 Weighted potential source contribution analysis (WPSCF) of atmospheric NH_3 and estimated NH_4^+ in Beijing during 03/16/2016 – 03/16/2017. Note: WPSCF analysis performed for NH_3+NH_4^+ was in line with that for NH_3.