

Long-term trends of source apportioned particle number concentrations in a metropolitan area of the northeastern United States

Stefania Squizzato^{1,2}, Mauro Masiol^{1,2}, Fereshteh Emami^{2,3}, David C. Chalupa⁴, David Q. Rich^{1,4}, and Philip K. Hopk^{e,2}

¹ Dept. Public Health Sciences, University of Rochester Medical Center, Rochester, NY 14642.

² Center for Air Resources Engineering and Science, Clarkson University, Potsdam, NY 13699.

³ Dept. Chemistry and Physics, Southeastern Louisiana University, Hammond, LA 70402.

⁴ Dept. Environmental Medicine, University of Rochester Medical Center, Rochester, NY 14642.

Summer - Nucleation

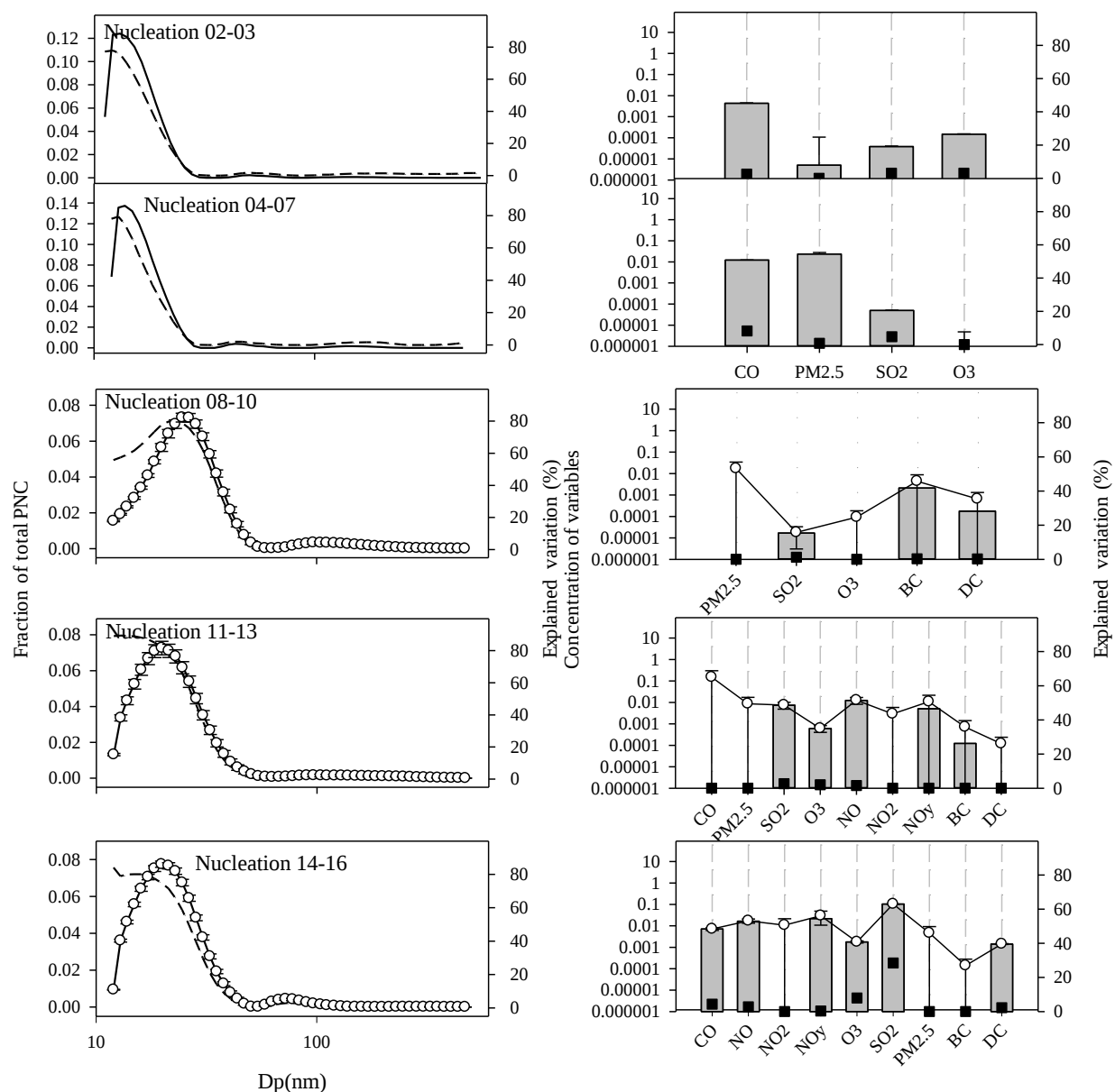


Figure S1. Nucleation source profiles for summer. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

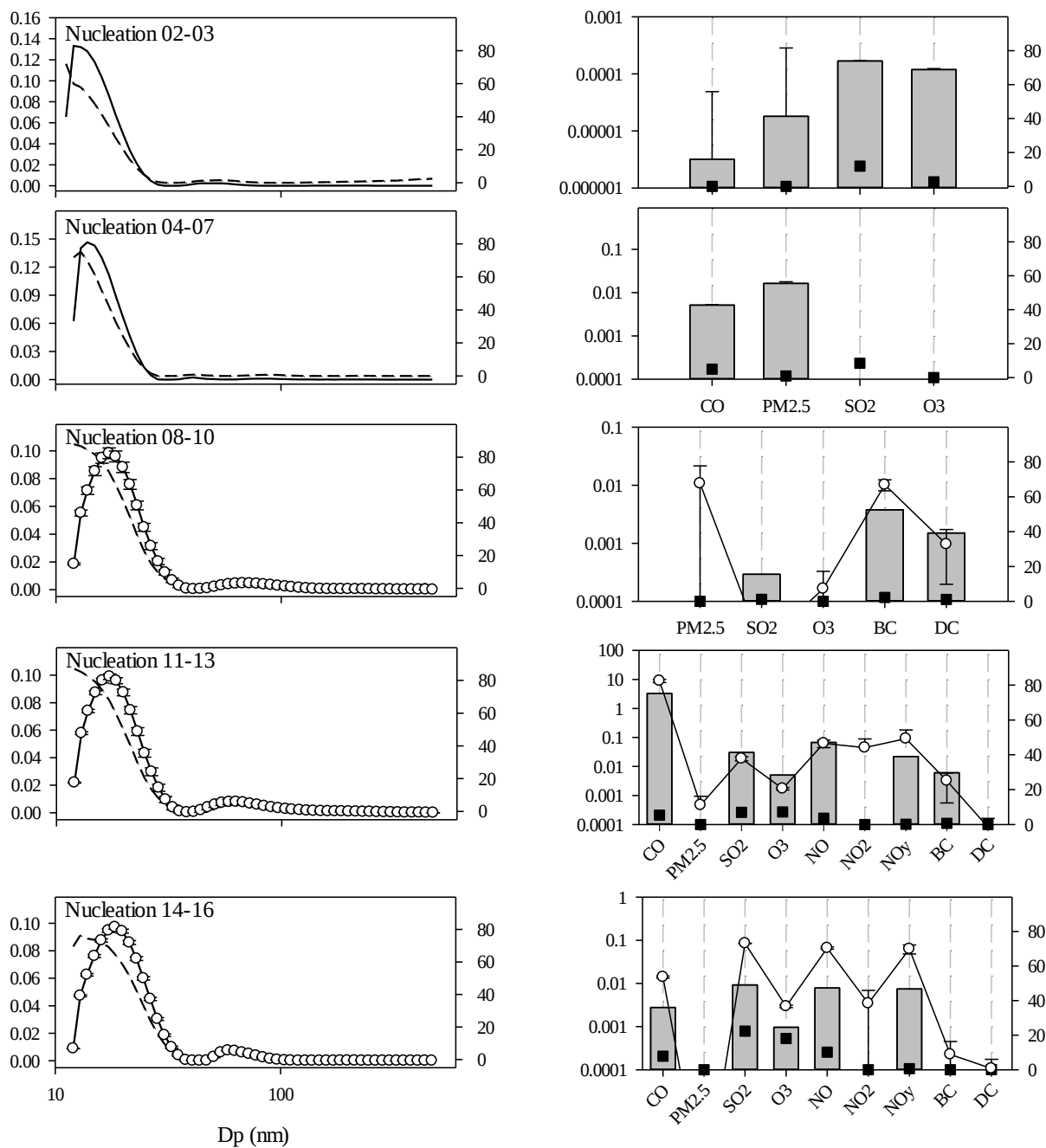


Figure S2. Nucleation source profiles for transition. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Winter - Nucleation

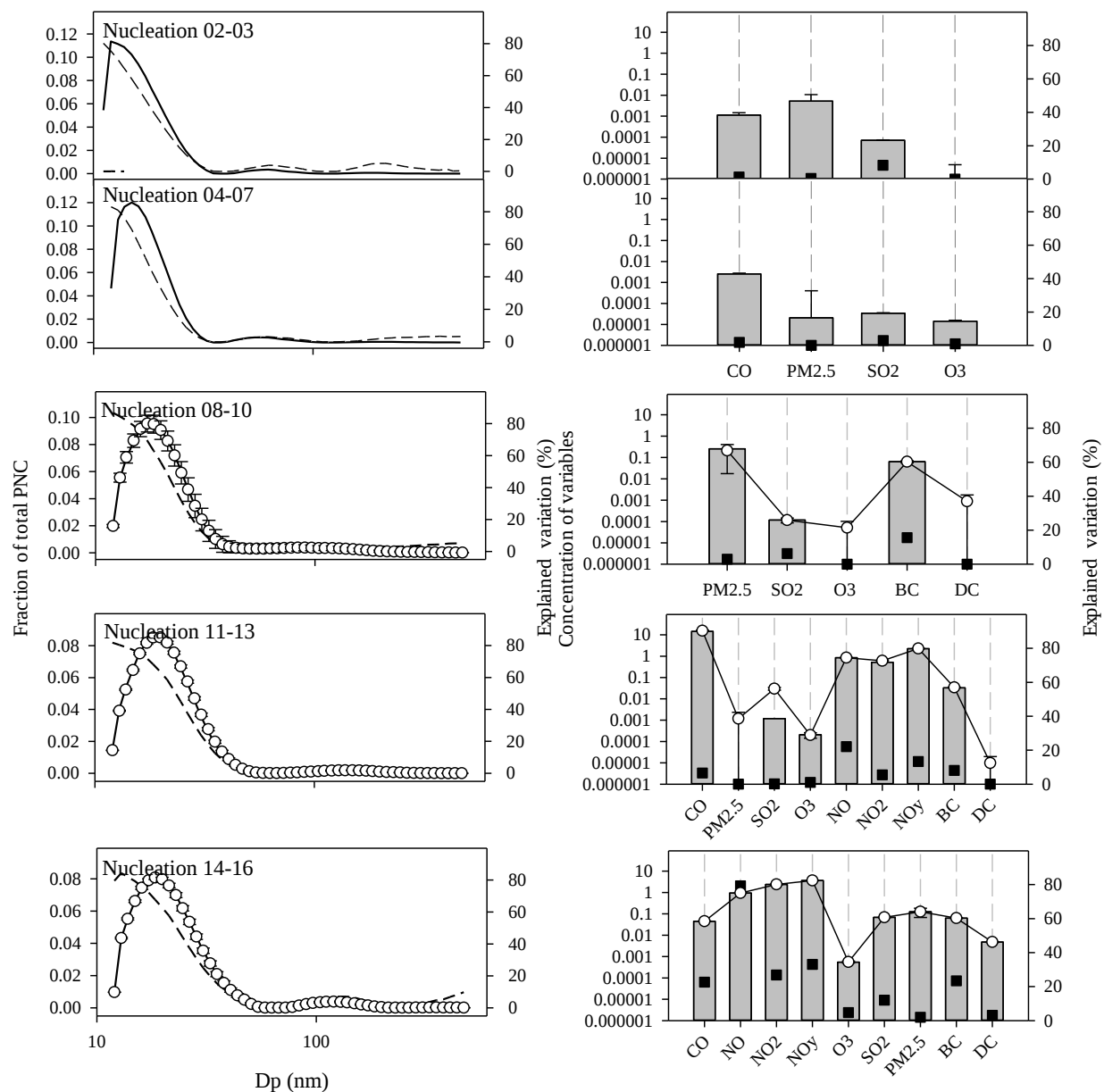


Figure S3. Nucleation source profiles for winter. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Summer – Traffic 1

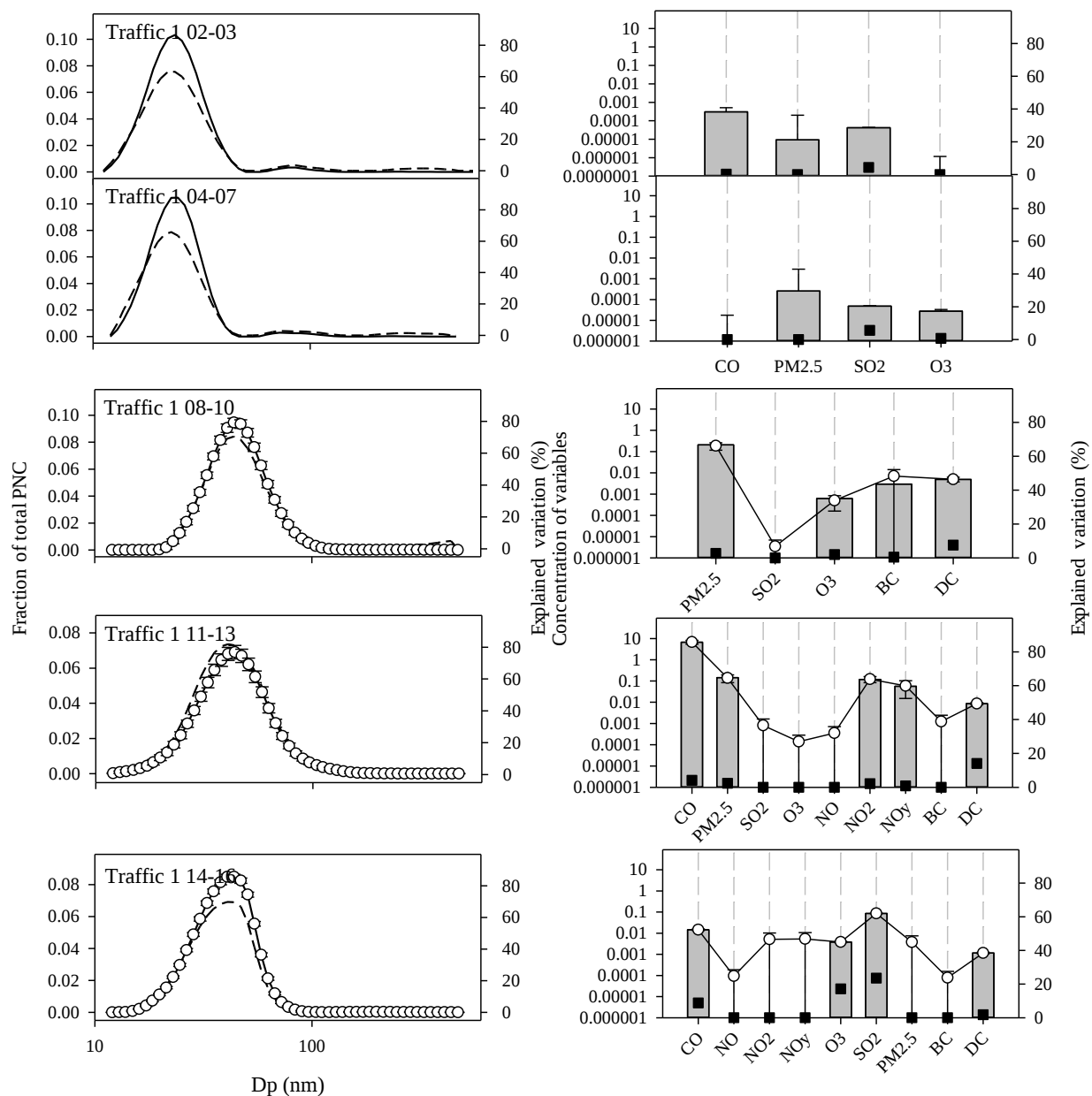


Figure S4. Traffic 1 source profiles for summer. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

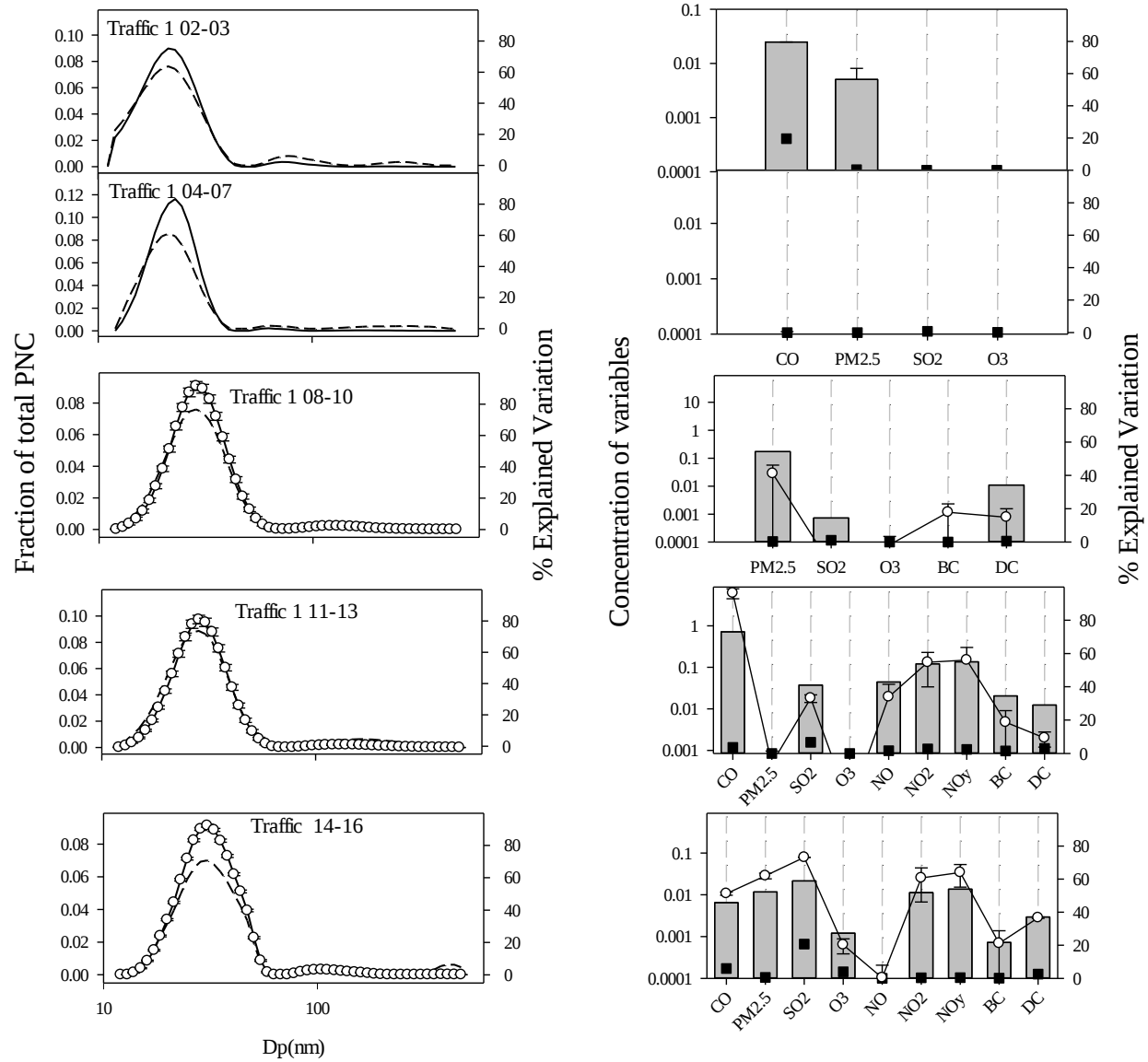


Figure S5. Traffic 1 source profiles for transition. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Winter – Traffic 1

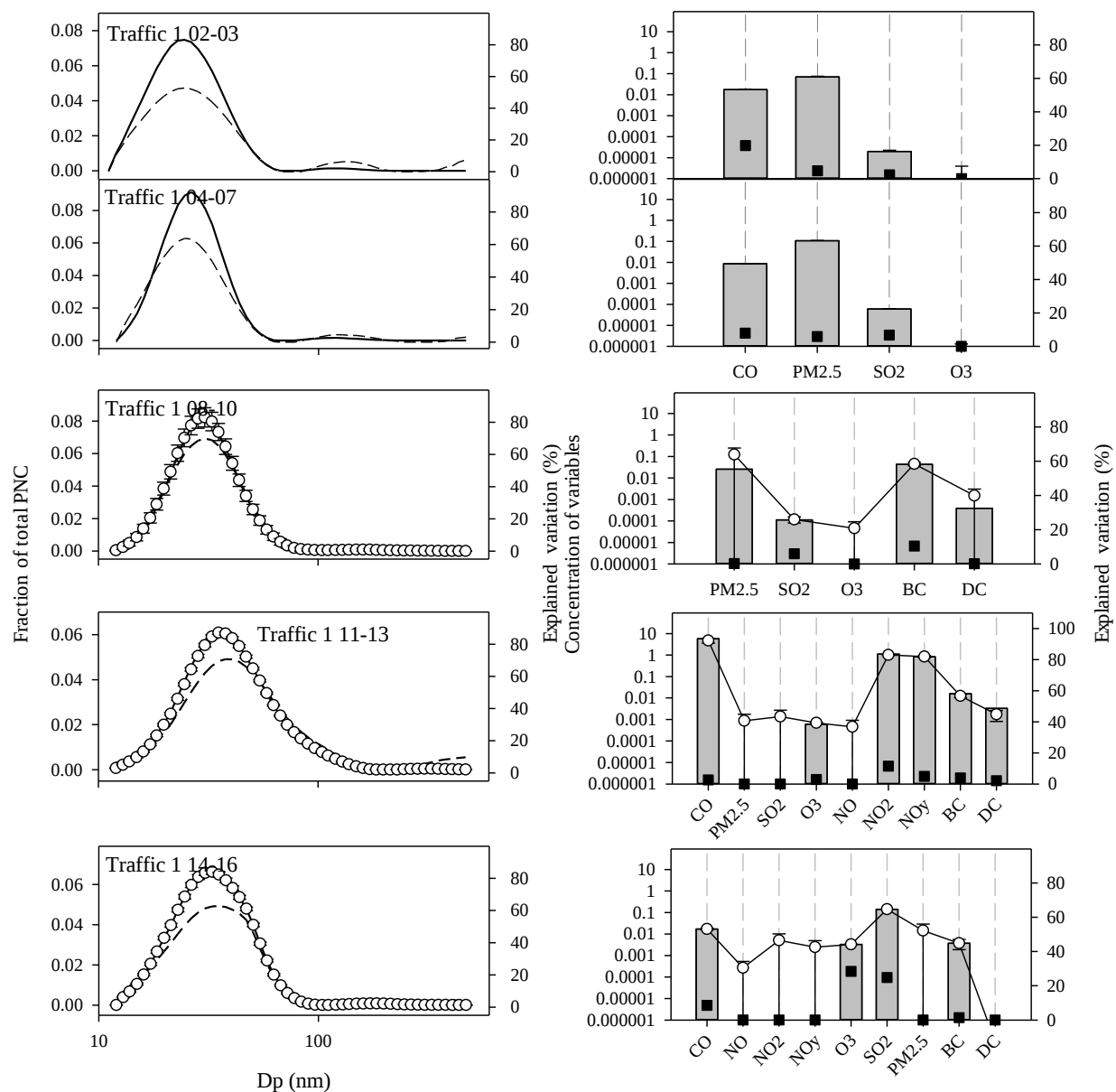


Figure S6. Traffic 1 source profiles for winter. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Summer – Traffic 2

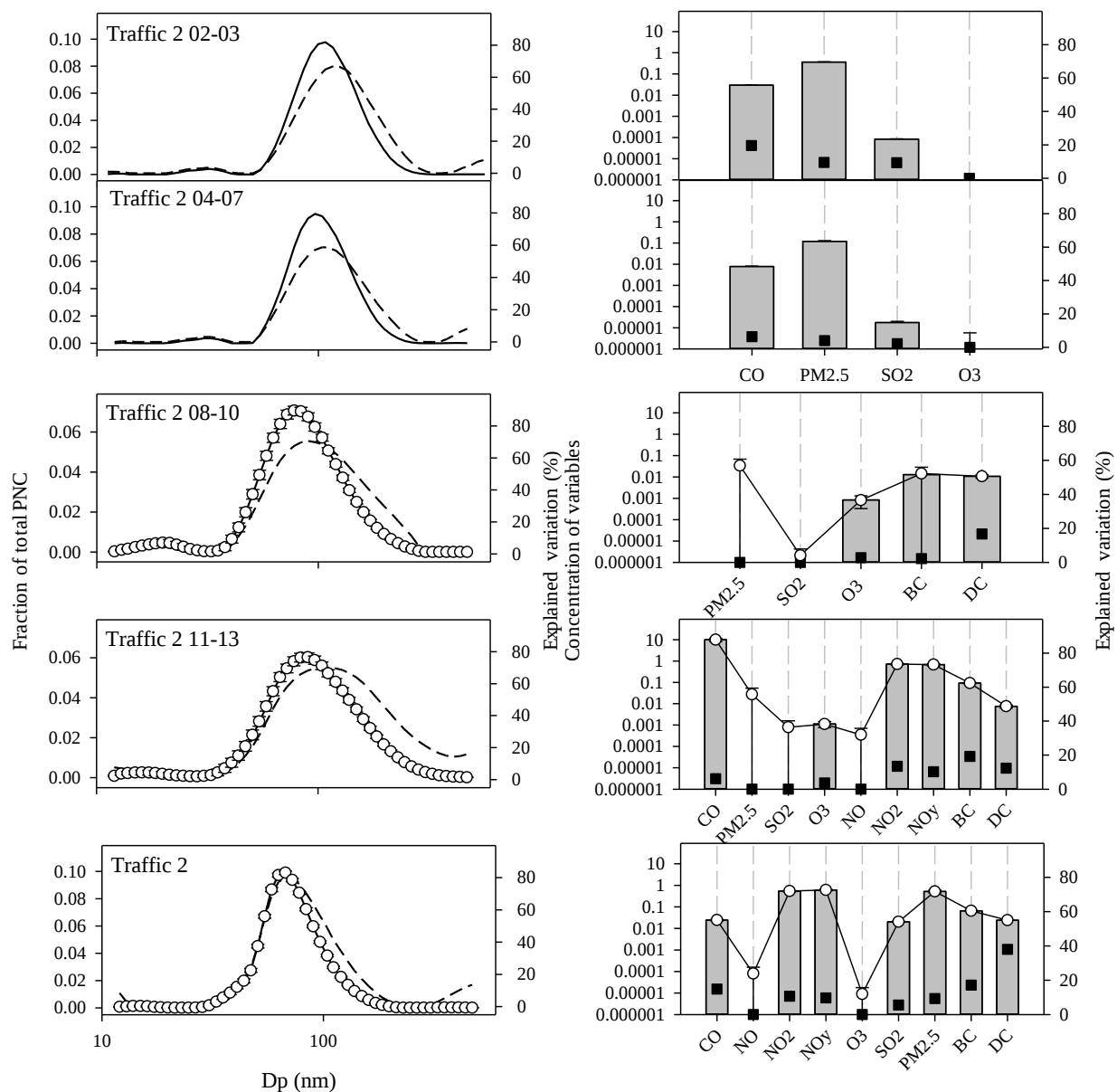


Figure S7. Traffic 2 source profiles for summer. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

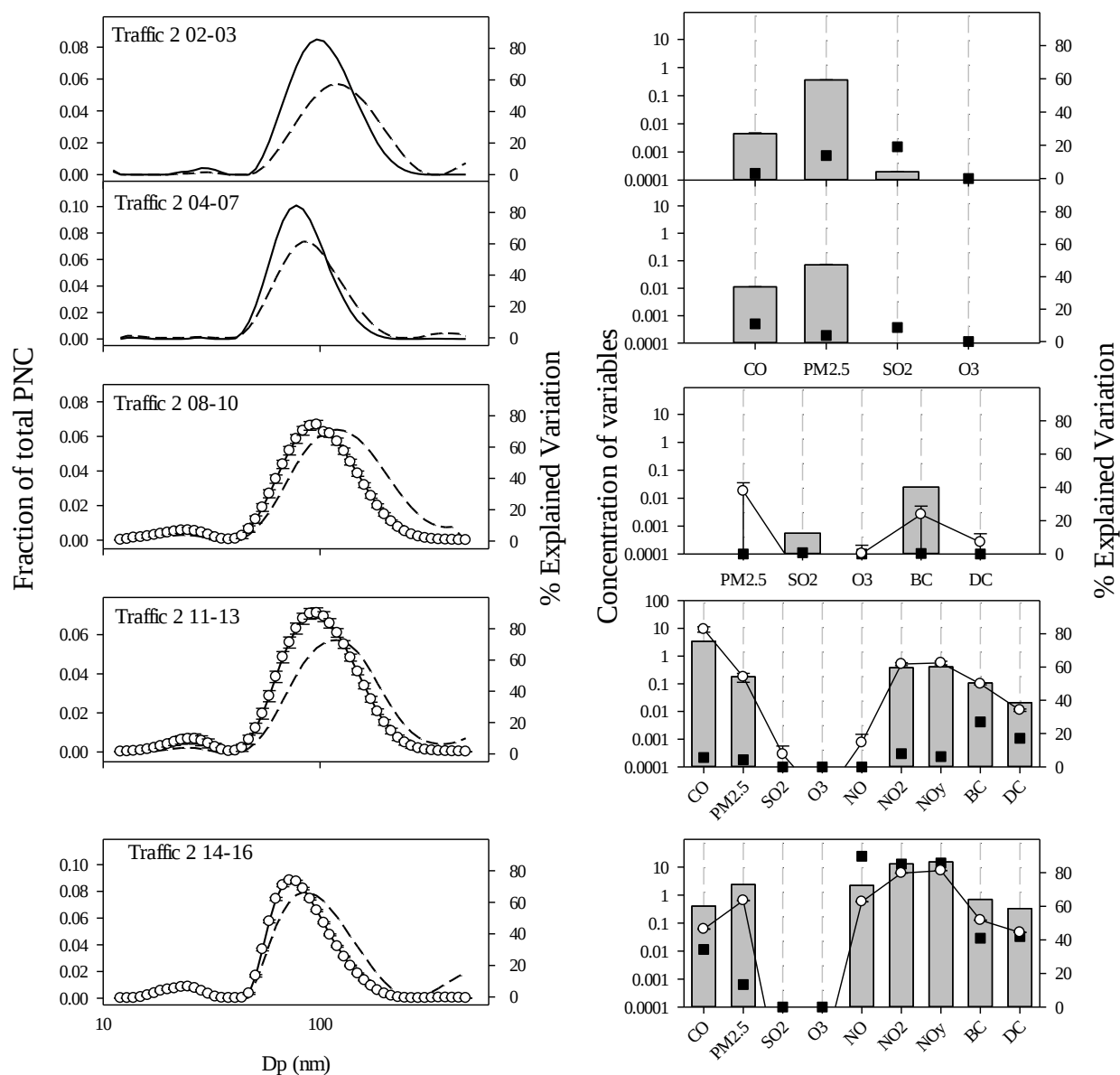


Figure S8. Traffic 2 source profiles for transition. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Winter – Traffic 2

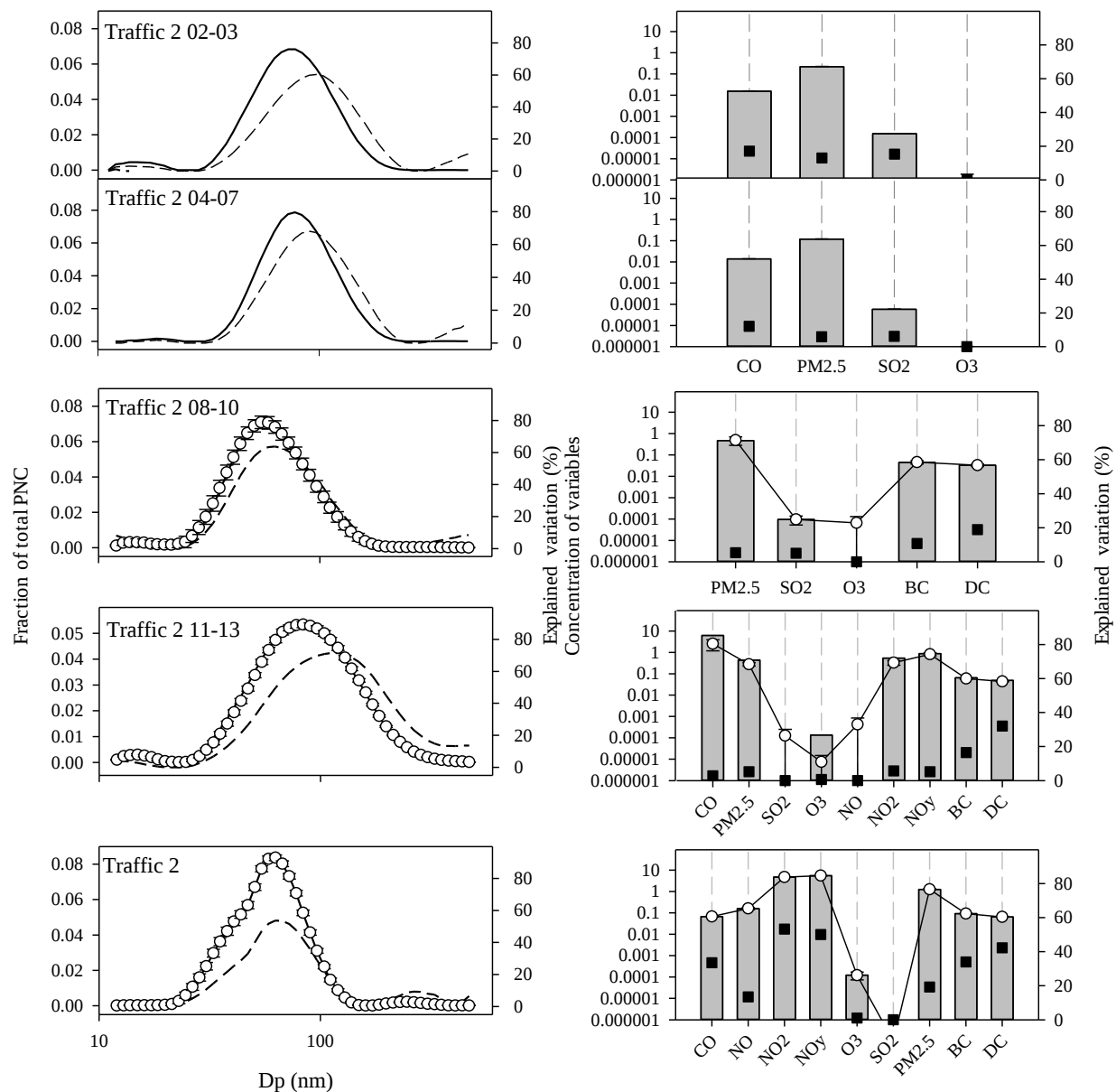


Figure S9. Traffic 2 source profiles for winter. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Summer – O₃-rich aerosol

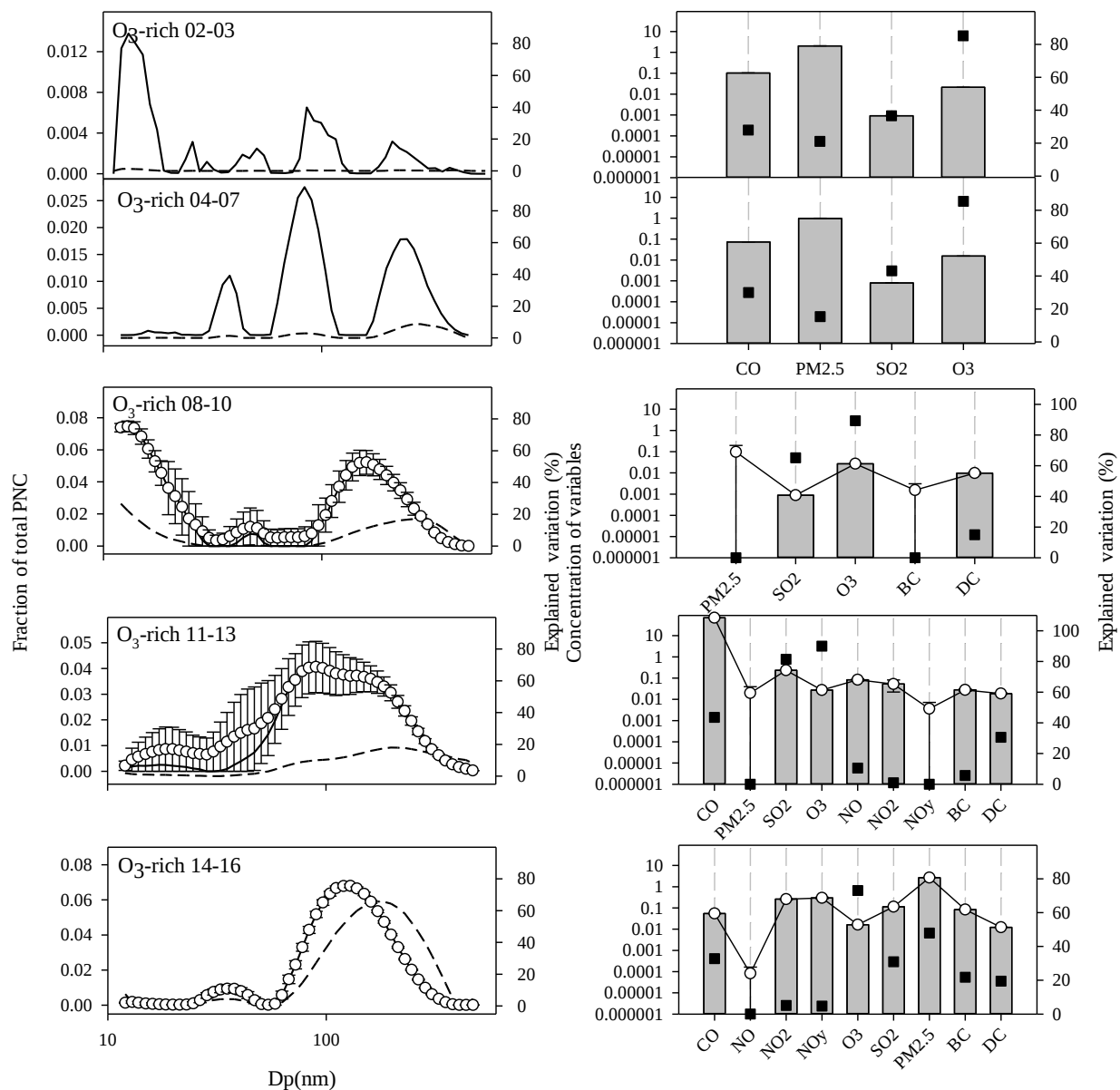


Figure S10. O₃-rich aerosol source profiles for summer. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Transition – O₃-rich aerosol

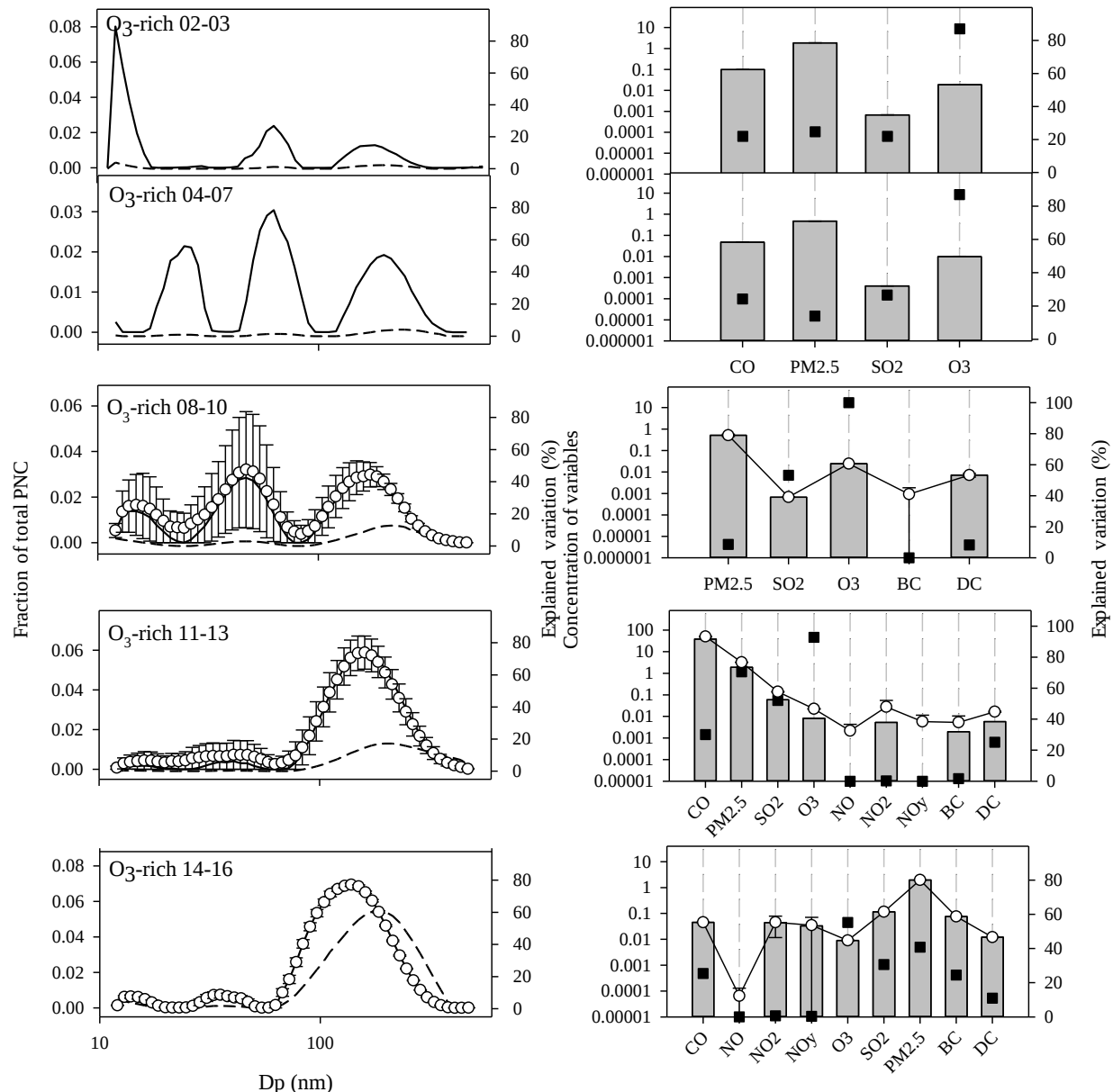


Figure S11. O₃-rich aerosol source profiles for transition. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Winter – O₃-rich

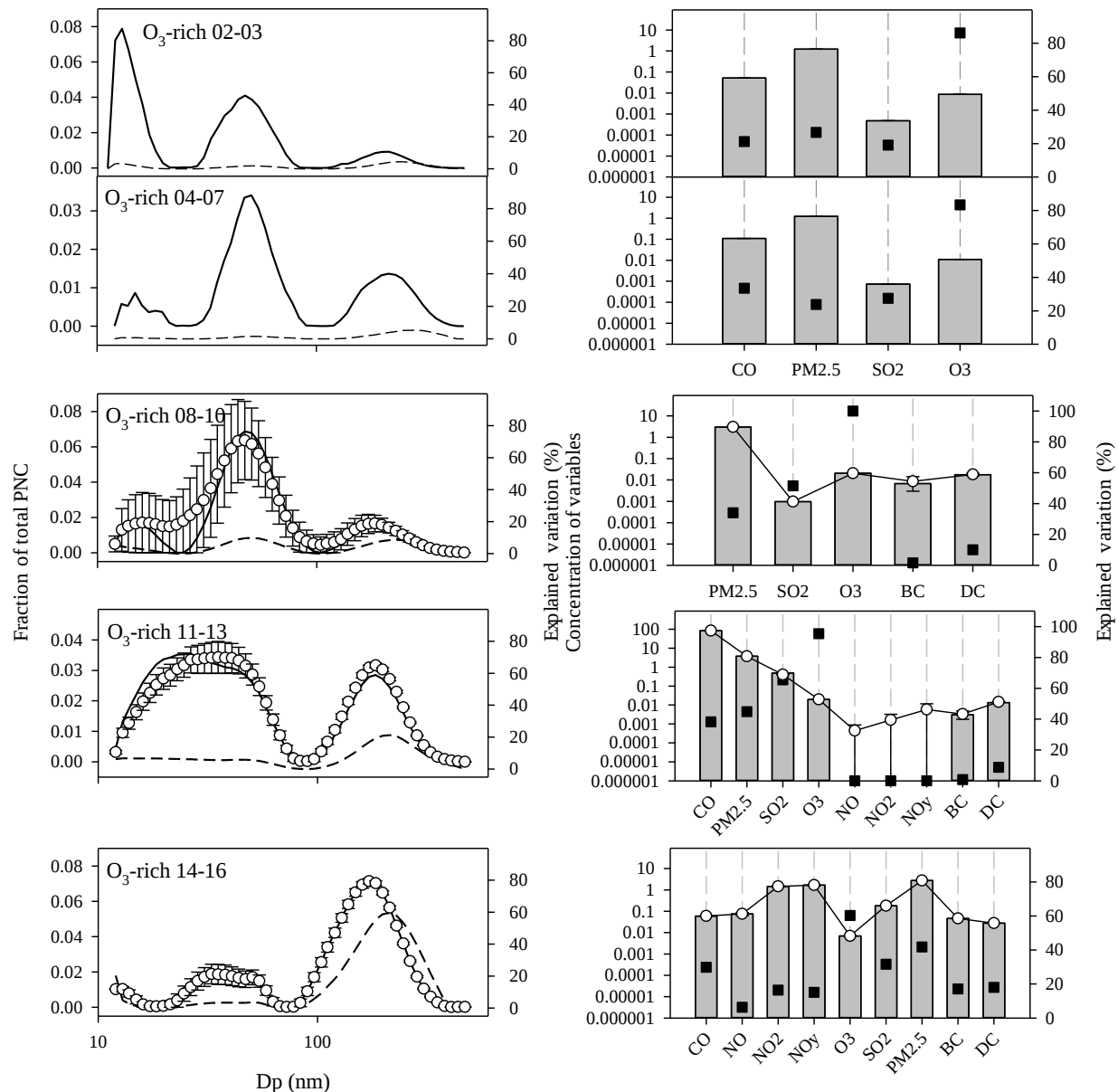


Figure S12. O₃-rich aerosol source profiles for winter. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Transition - Residential/Commercial Heating

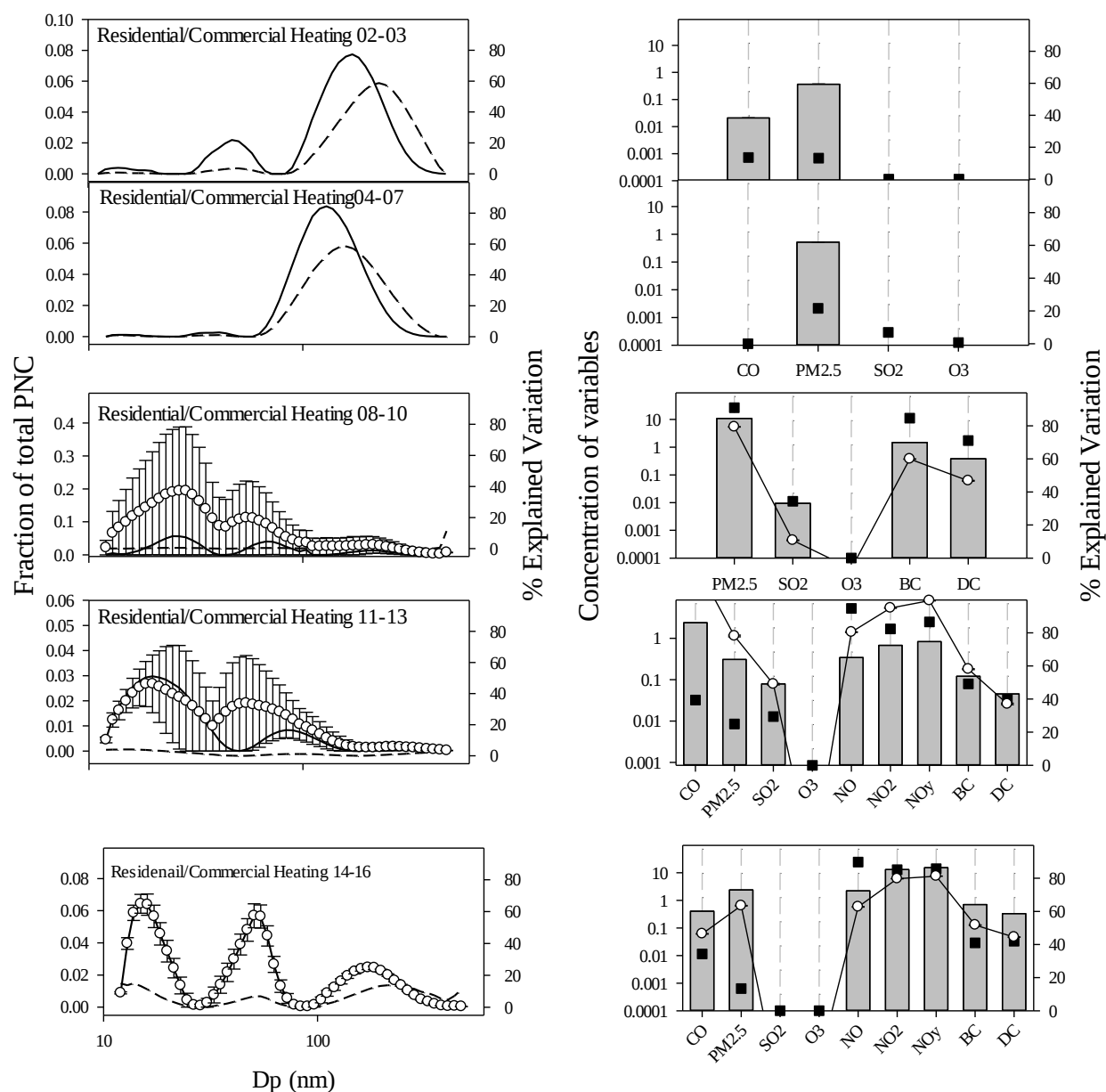


Figure S13. Residential/Commercial heating source profiles for transition. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Winter – Residential/Commercial heating

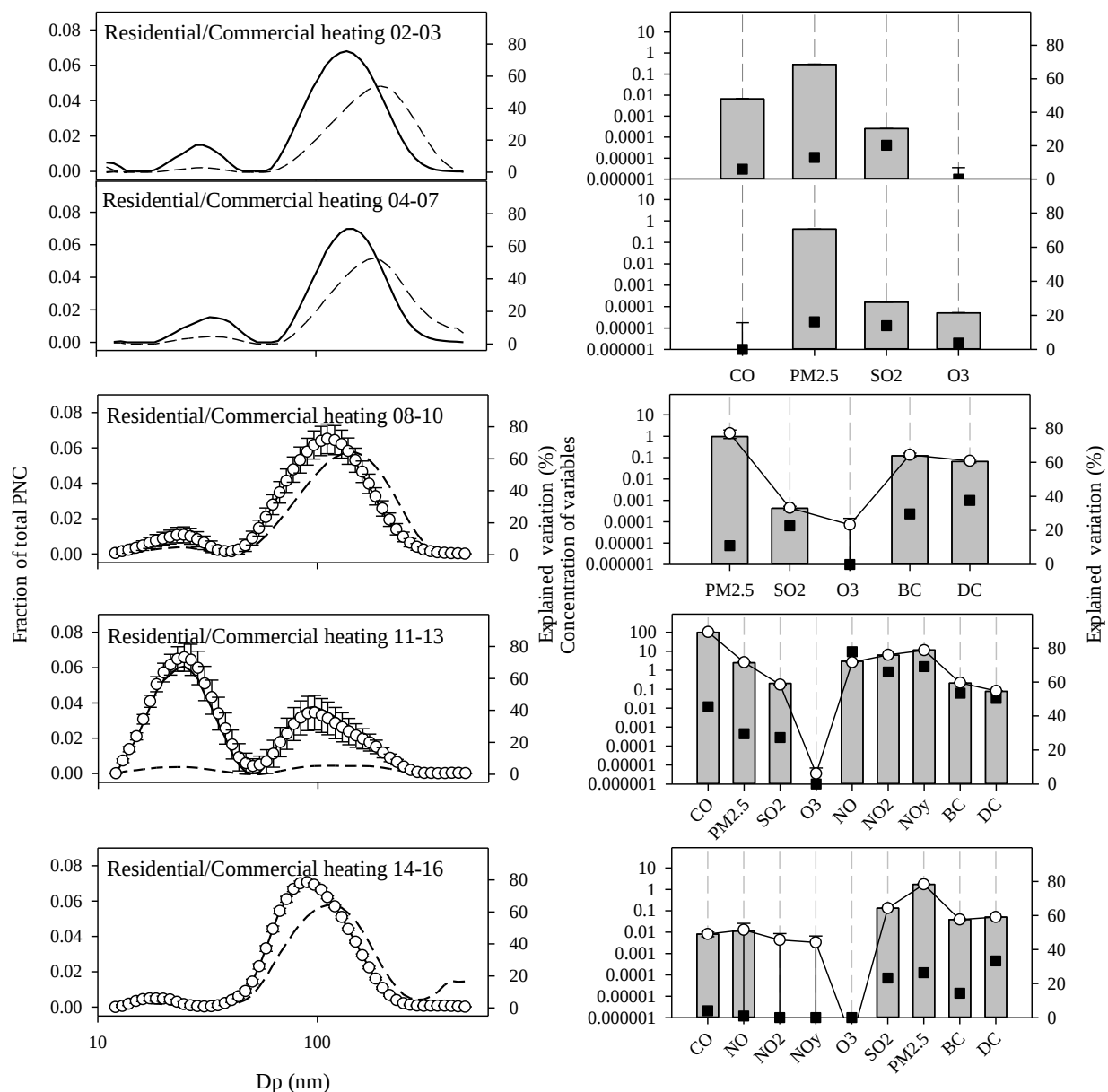


Figure S14. Residential/Commercial heating source profiles for winter. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Transition – Secondary nitrate

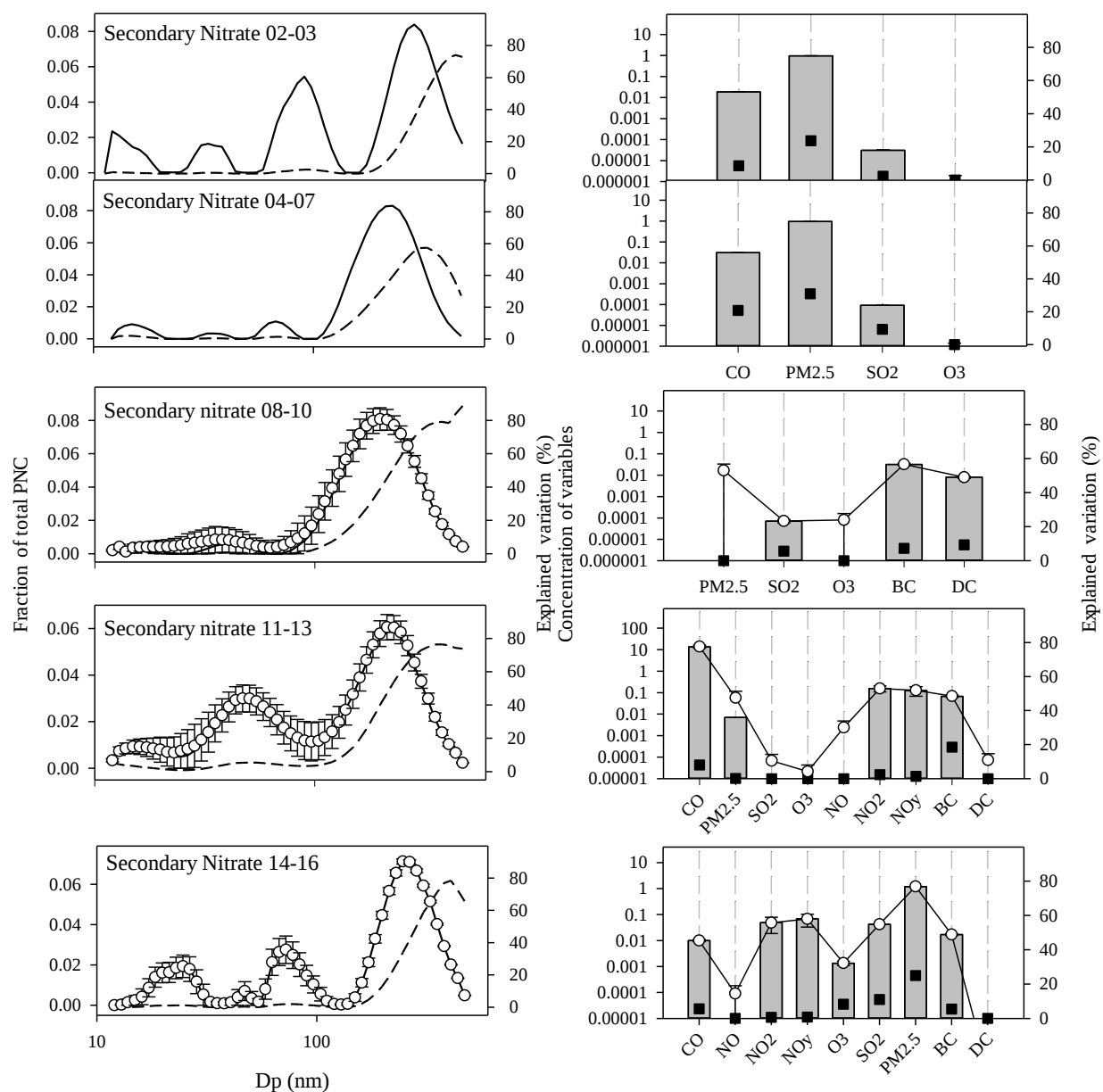


Figure S15. Secondary nitrate source profiles for transition. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Winter – Secondary nitrate

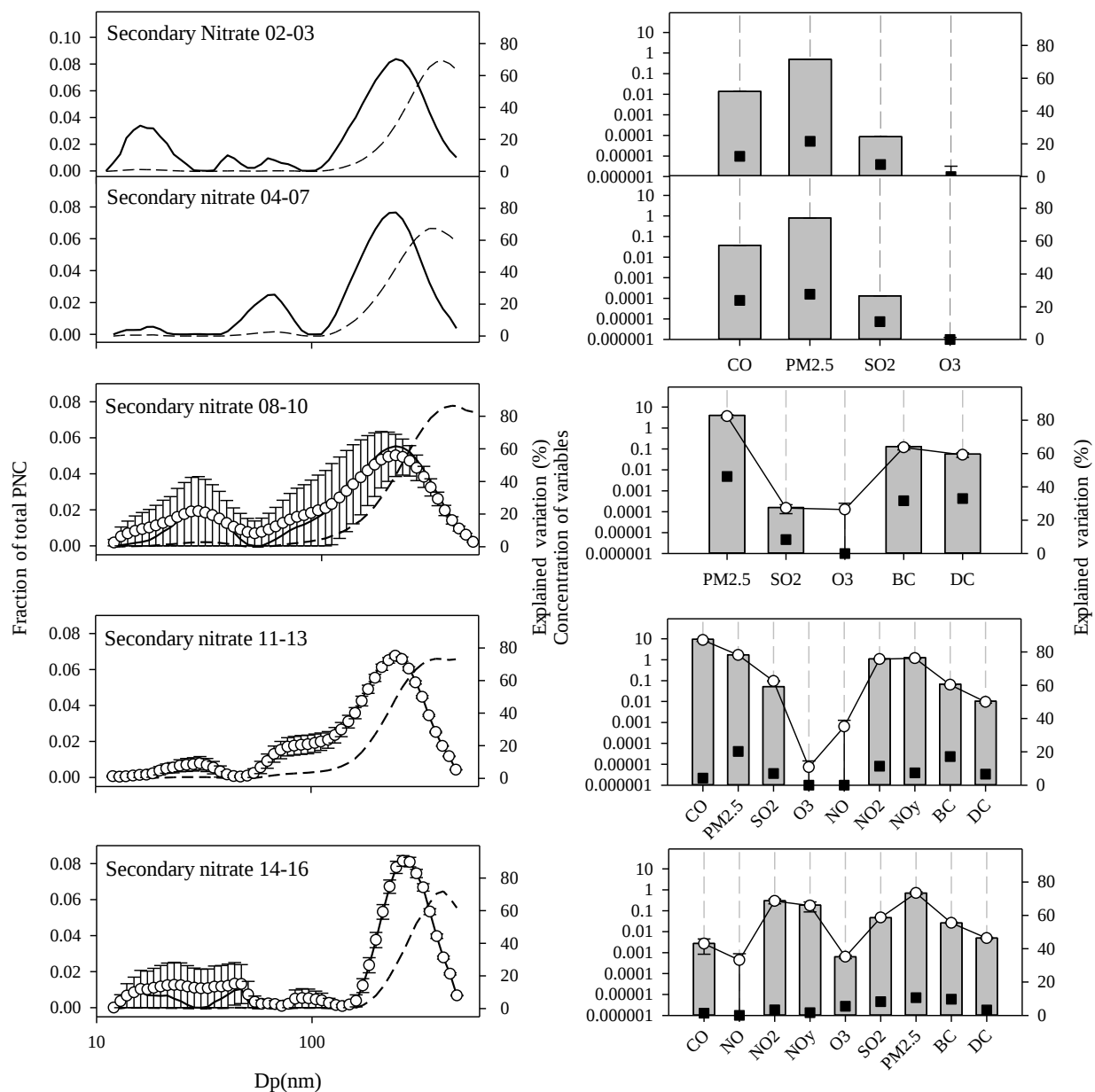


Figure S16. Secondary nitrate source profiles for winter. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Summer – Secondary sulfate

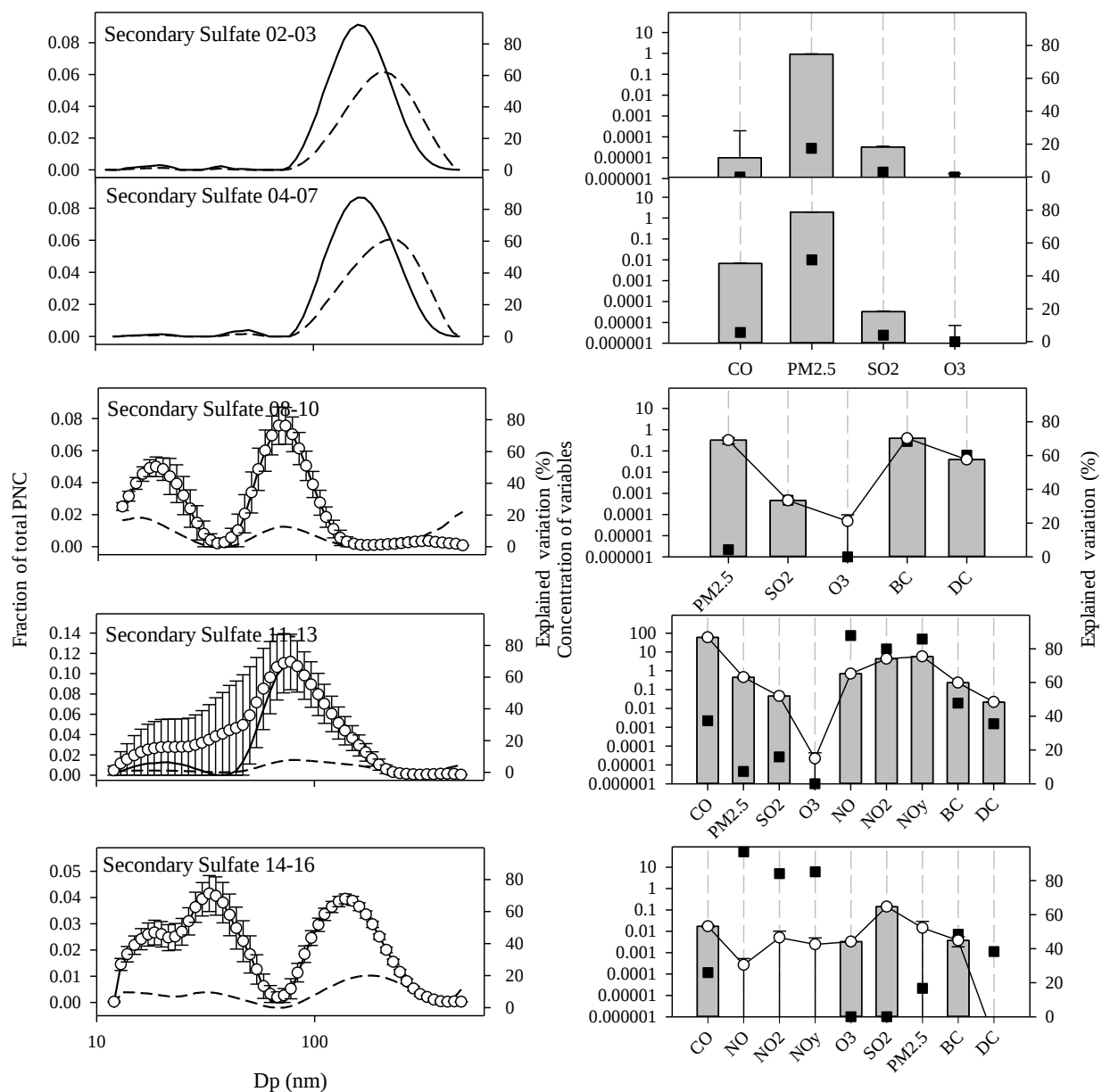


Figure S17. Secondary sulfate source profiles for summer. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Transition – Secondary sulfate

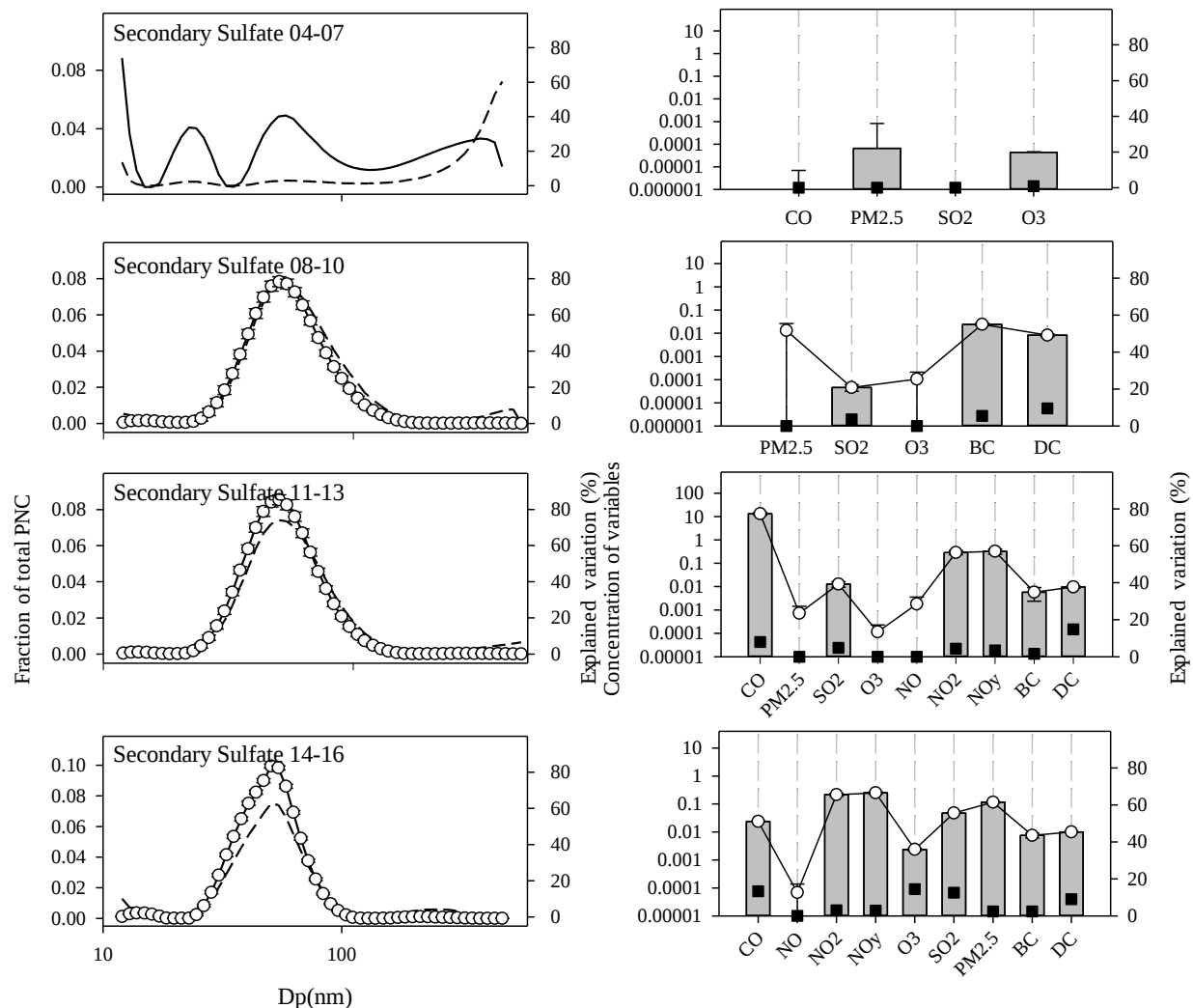


Figure S18. Secondary sulfate source profiles for transition. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

Summer – Regional transported aerosol

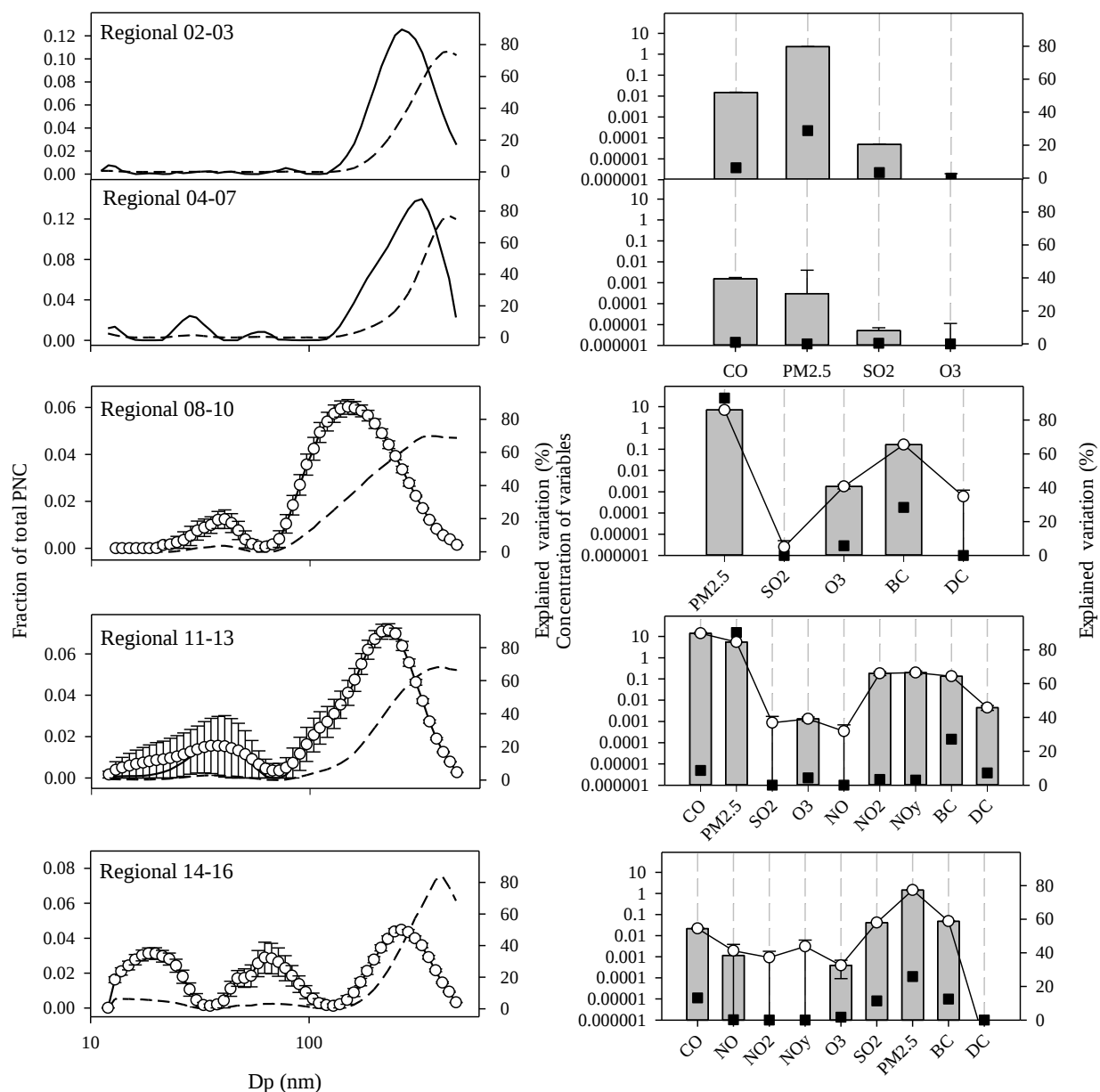


Figure S19. Regional transported aerosol source profiles for summer. PNSD profiles: the black solid lines present the normalized fractions on the total PNC, the open circles are the mean fractional DISP values, the error bars represent the minimum and maximum fractional DISP values, and the dashed lines present the % explained variation. Species profiles: the bars present the base case values, the open circles are the mean DISP values, the error bars represent the minimum and maximum DISP values, and the filled squares present the % explained variation.

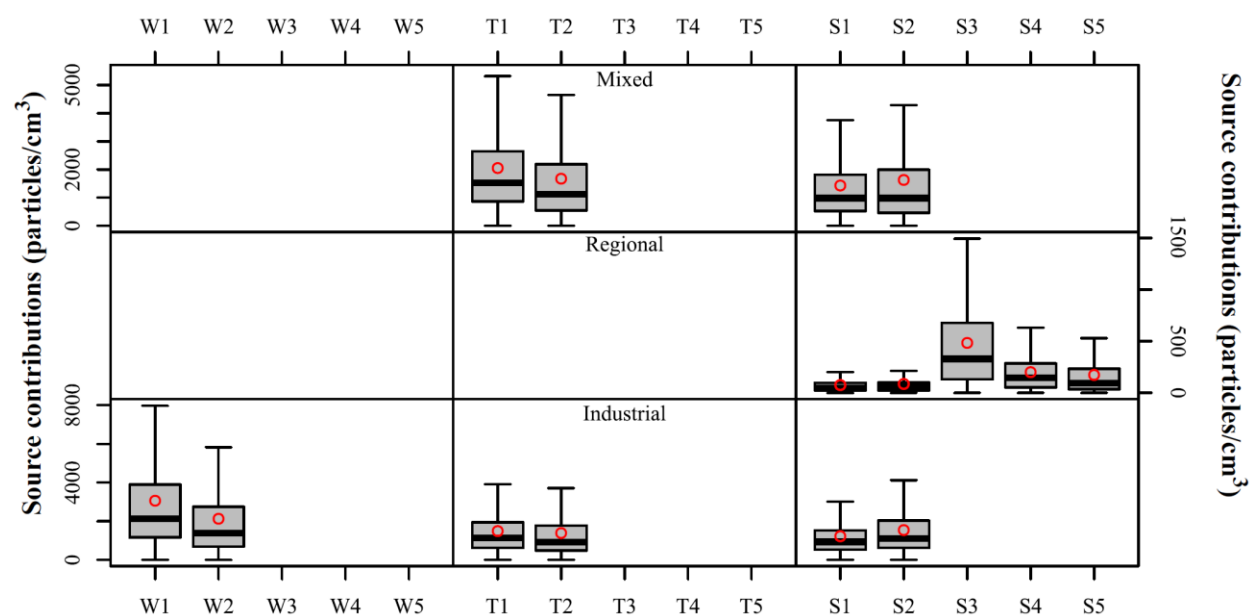


Figure S20. Average and ranges of concentrations of identified sources as boxplots by season and by period (line=median, red circle=mean, box=inter-quartile range, whiskers= ± 1.5 *inter-quartile range).

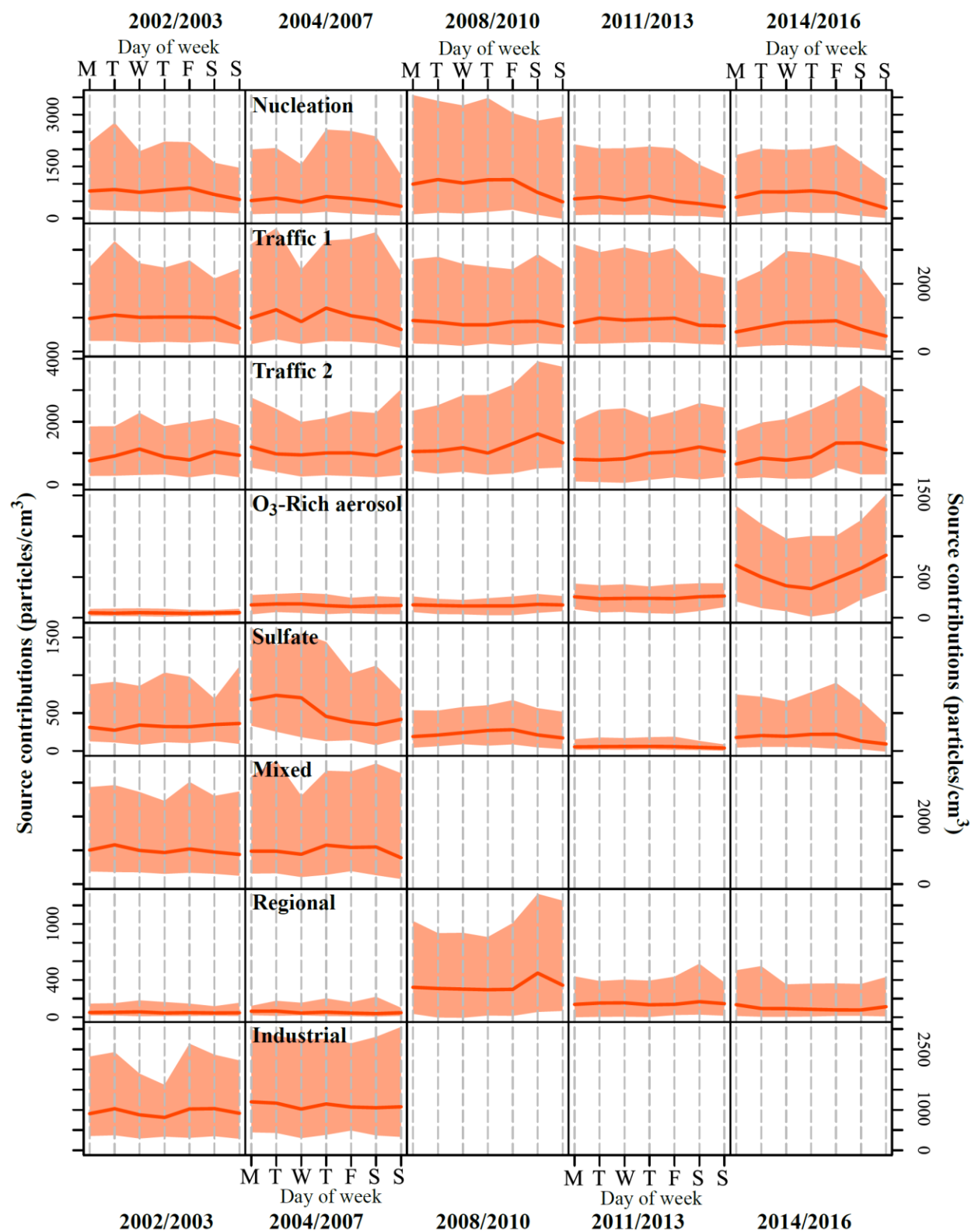


Figure S21. Day of the week variations of the identified sources during summer. Each plot reports the hourly average source contribution as a filled line and the associated 75th and 99th confidence intervals calculated by bootstrapping the data ($n=200$).

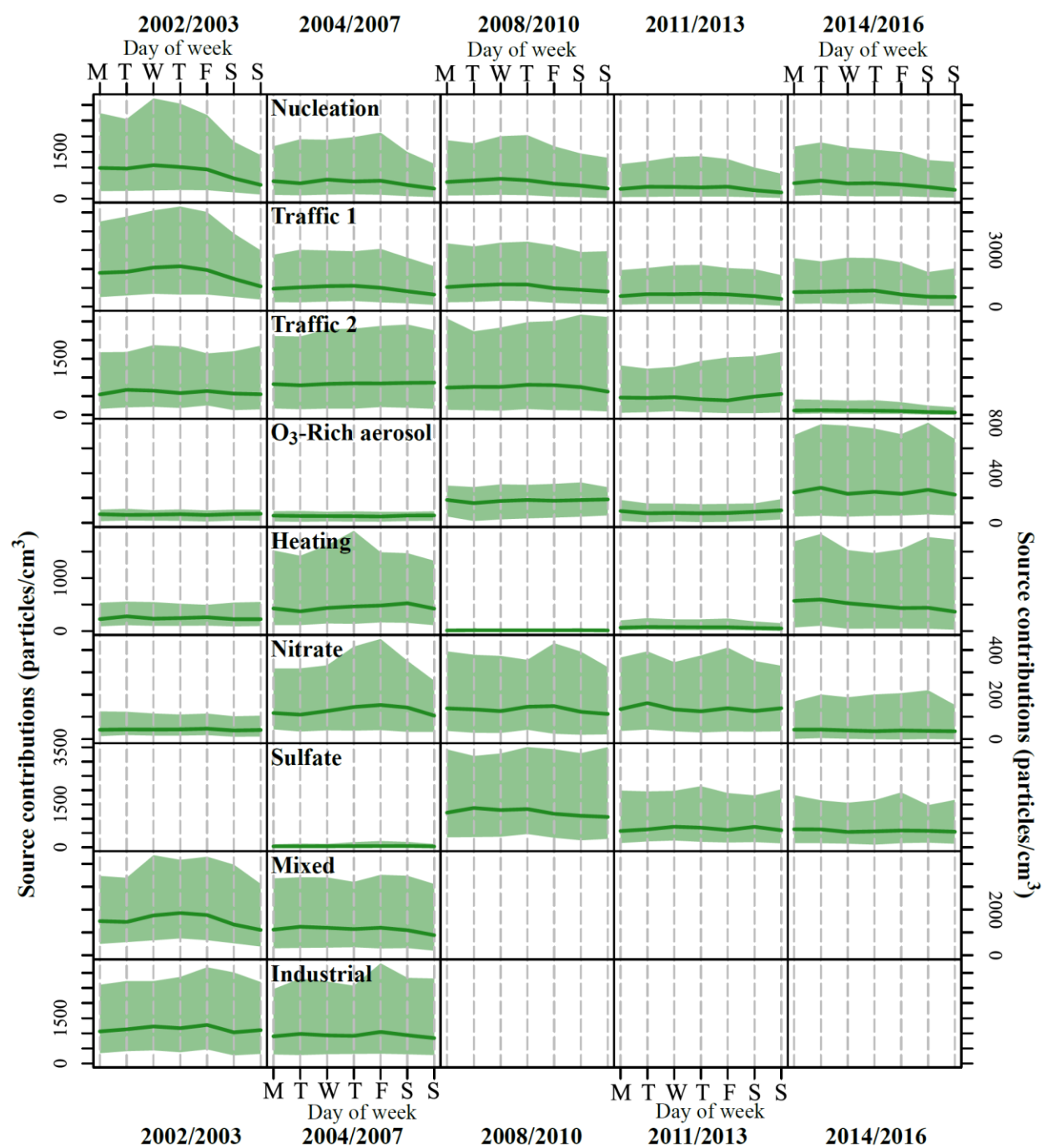


Figure S22. Day of the week variations of the identified sources during transition. Each plot reports the hourly average source contribution as a filled line and the associated 75th and 99th confidence intervals calculated by bootstrapping the data ($n=200$).

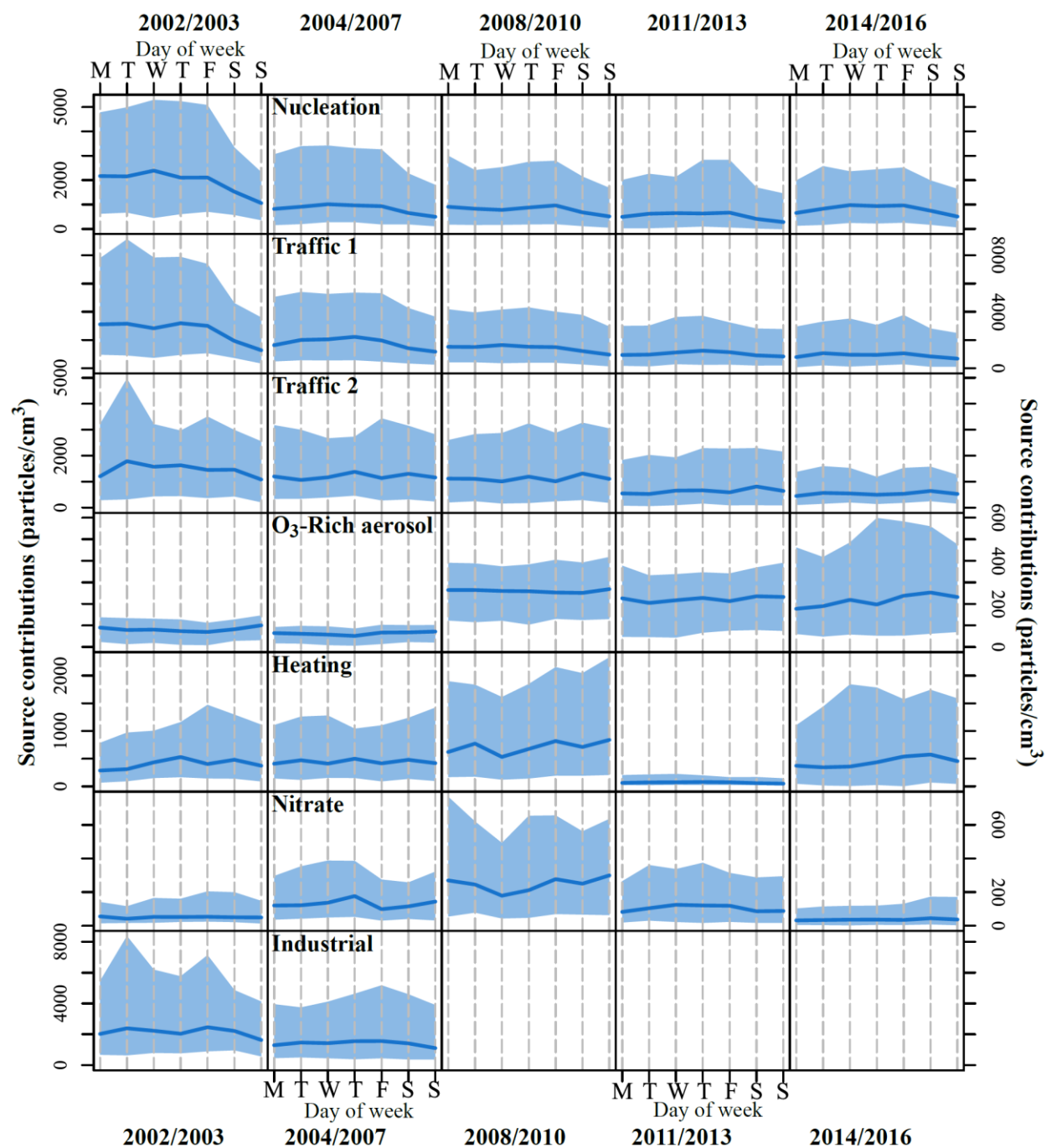


Figure S23. Day of the week variations of the identified sources during winter. Each plot reports the hourly average source contribution as a filled line and the associated 75th and 99th confidence intervals calculated by bootstrapping the data (n= 200).