Supporting Information (SI)

for

Source apportionment of airborne nanoparticles in a Middle Eastern city using Positive Matrix Factorization

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The SI includes:

S1. Effect of ambient temperature and wind speed on PNCs

The studied area is featured by its high temperature (up to ~48 ºC). Ambient temperature and wind speed were key parameters affecting the PNCs in various size ranges. The variations in ambient temperature and wind speed varied in the 28-48 °C and 0.26-15.25 m s^{-1} ranges, respectively. Sufficient variation in ambient temperature allows assessing the influence of temperature on PNCs. We normalised the total PNCs by the traffic volume to remove the dependency of PNCs on the traffic volume. The influence of wind direction on PNCs were also removed by only selecting one wind direction (i.e., data from the north-westerly winds was used that represented the majority of the data[1]). Then, the influence of temperature on PNCs were analysed under three wind speed ranges that is low (2-3 m s^{-1}; representing 10% of the selected data), medium (5-7 m s^{-1}; representing 25% of the selected data), and high (9.5-10.5 m s^{-1}; representing 10% of the selected data) wind speeds ranges. A decrease in PNCs was observed with the increase in ambient temperature for all studied wind speed ranges, when fitted to a linear trend line, and this decrease was optimum for the low wind speed range (see Figure S3). The reason for this decrease was attributed to the partial evaporation,[2] caused by the increase temperature, and hence an increase in coagulation rate.[2] Detailed information about the influence of meteorological parameters on PNCs are thoroughly discussed in our previous work.[1]

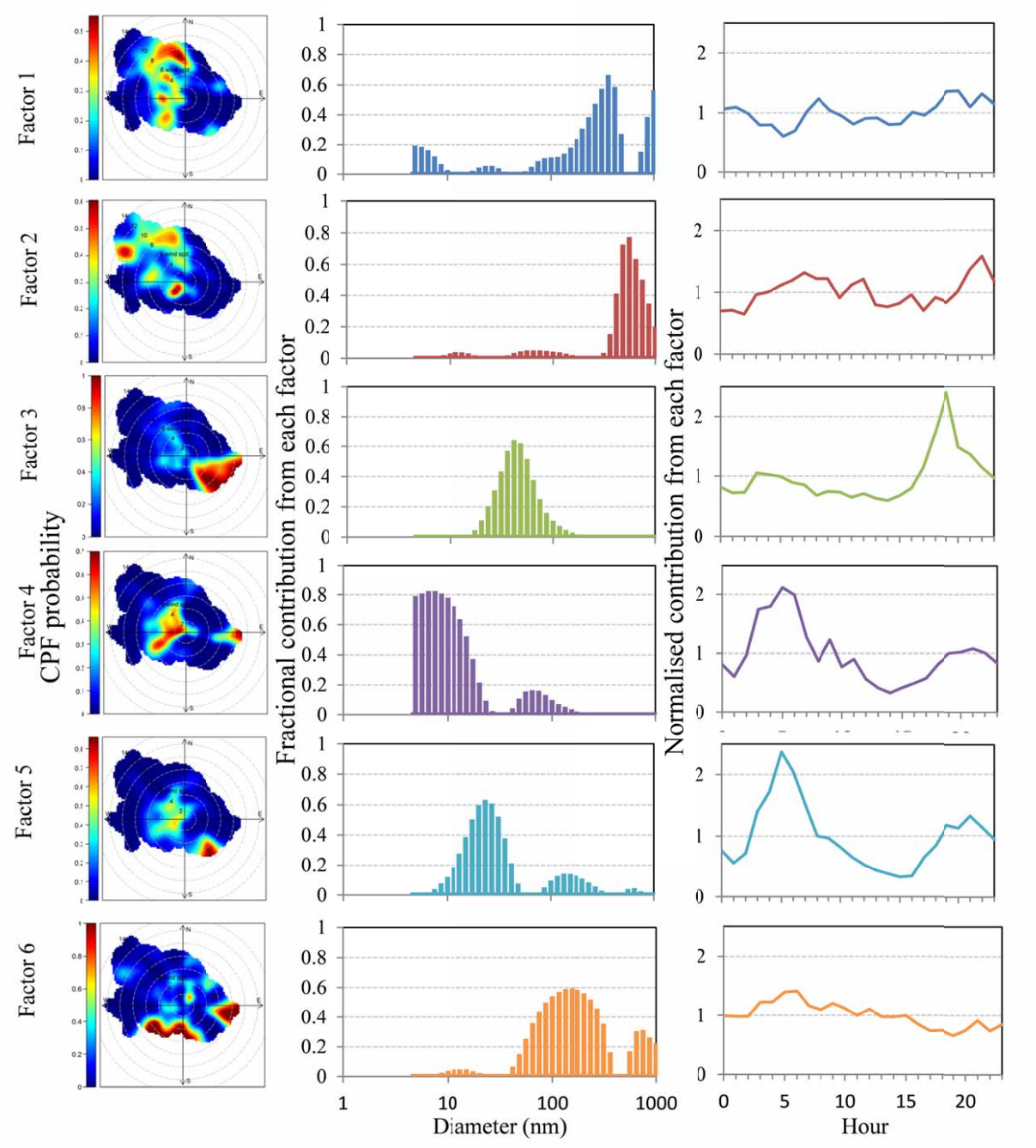

Figure S1: Directionality of the factor contribution using CPF plots at 75th percentile level for the non-dusty period, considering both local wind direction and speed (left vertical panels). The colours in CPF plots represent the probability of factor contribution with respect to wind direction and speed. Figures in the middle vertical panels represent the factor-specific PND profiles for the non-dusty period. Figures in the right vertical panels represent the diurnal variation of the normalised factor contribution for the non-dusty period.

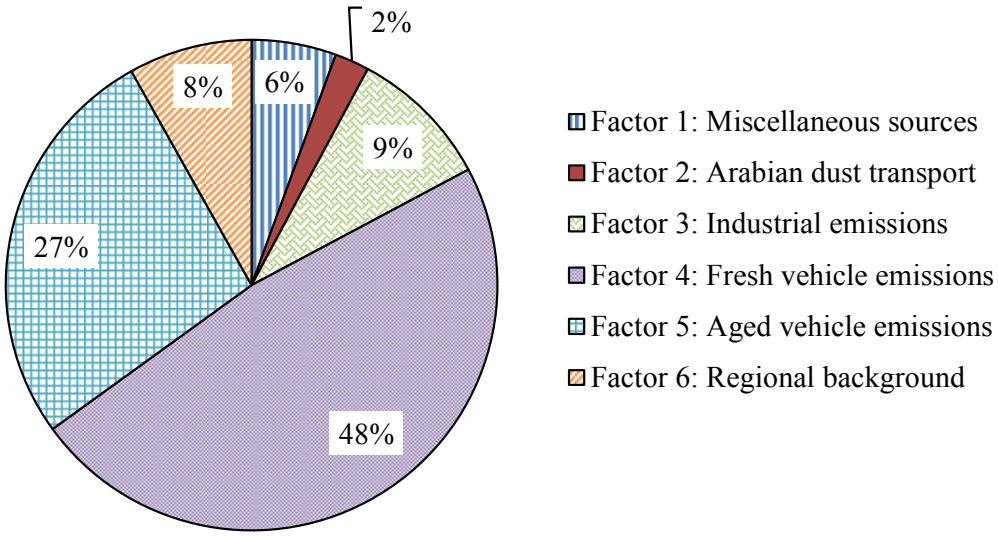

Figure S2: Sources contribution (%) to the total PNC data in the urban area of Fahaheel, Kuwait, for the non-dusty period.

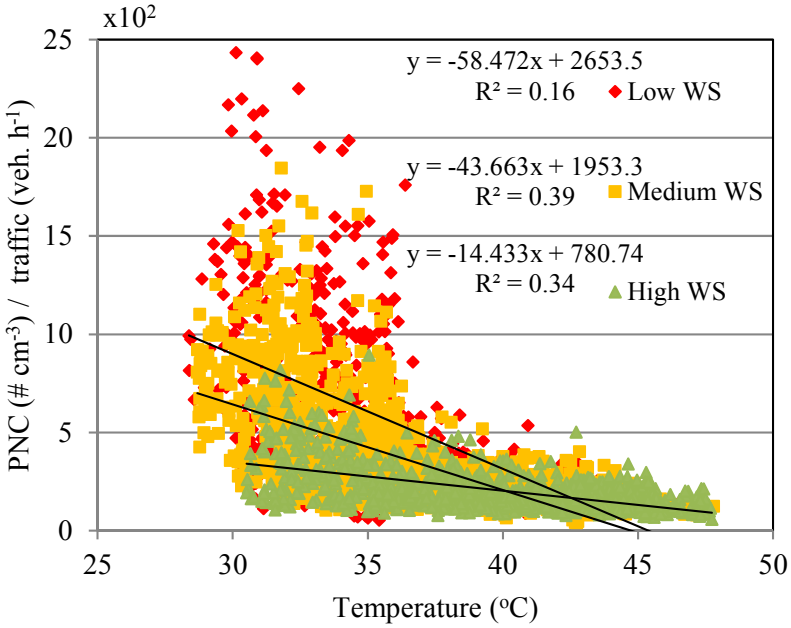

Figure S3: The relationship between normalised PNCs and ambient temperature under low (2-3 m s^{-1}; representing 10% of the selected data) medium (5-7 m s^{-1}; representing 25% of the selected data), and high (9.5-10.5 m s^{-1}; representing 10% of the selected data) wind speed ranges.

Table S1: Hourly Pearson product-moment correlations, along with the significance level (p-value), between each factor contribution and measured pollutants (PM_{10}, O_3, NO_x, SO_2 and CO) for the non-dusty period.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
PM_{10}	0.03	0.11[a]	–0.05[a]	–0.07[a]	–0.11[a]	0.09[a]
O_3	–0.20[a]	–0.08[a]	–0.15[a]	–0.39[a]	–0.48[a]	0.09[a]
NO_x	0.08[a]	0.09[a]	0.33[a]	0.32[a]	0.53[a]	0.13[a]
SO_2	–0.19[a]	–0.06[a]	0.50[a]	–0.02	0.06[a]	0.24[a]
CO	–0.01	0.09[a]	0.29[a]	0.15[a]	0.31[a]	0.13[a]

[a] Correlation is significant at the 0.01 level.

References

1. A. N. Al-Dabbous and P. Kumar, *Environ. Sci. Technol.*, 2014, 48, 13634-13643.
2. M. Jacobson, D. Kittelson and W. Watts, *Environ. Sci. Technol.*, 2005, 39, 9486-9492.