Supplementary Material

High-resolution sampling and analysis of ambient particulate matter in the Pearl River Delta region of Southern China: source apportionment and health risk implications

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1. Foshan $PM_{2.5}$ and $PM_{2.5-10}$ PMF receptor modelling diagnostics

PMF analyses involve many details about the development of the data, decisions of what data to include/exclude, determination of a solution, and evaluation of robustness of that solution. The following diagnostics for the PMF solutions are reported as recommended by Paatero and co-workers (Paatero et al., 2014;Brown et al., 2015).

Summary of EPA PMF settings for receptor modelling of Foshan $PM_{2.5}$ and $PM_{2.5-10}$

Parameter	Setting
Data type; averaging timeframe	$PM_{2.5}$, $PM_{10-2.5}$, Hourly
N samples	1127
N factors	6
Treatment of missing data	No missing data
Treatment of data below detection limit (BDL)	Data used as reported, no modification or censoring of BDL data
Lower limit for normalized factor contributions gik	-0.2
Robust mode	Yes
Constraints	None
Seed value	Random
N bootstraps in BS	400
r^2 for BS	0.6
DISP dQmax	4, 8, 16, 32
DISP active species	SO_2, NO_2, CO, PM_{10}, $PM_{2.5}$, BC, S, Cl, K, Ca, V, Cr, Fe, Ni, Zn, As, Pb, Al-C, Si-C, S-C, Cl-C, K-C, Ca-C, Fe-C
N bootstraps; r^2 for BS in BS-DISP	400; 0.6
BS-DISP active species	BC, S, Cl, K, Ca, V, Cr, Fe, Ni, Zn, As, Pb, Al-C, Si-C, S-C, Cl-C, K-C, Ca-C, Fe-C
BS-DISP dQmax	0.5, 1, 2, 4
Extra modelling uncertainty	15%

Output diagnostics for receptor modelling of Foshan $PM_{2.5}$ and $PM_{2.5-10}$

Diagnostic	6 factors
$Q_{Theoretical}$	23625
$Q_{Expected}$	21225
Q_{true}	15594
Q_{robust}	15589
$Q_{robust}/Q_{expected}$	0.735
DISP Diagnostics:	
Error code	0
Largest decrease in Q	0
DISP % dQ	0
DISP swaps by factor	0
BS-DISP Diagnostics:	
BS mapping (Fpeak BS – Unmapped)	92% (99% – 0)
BS-DISP % cases accepted	89%
Largest Decrease in Q:	-39.98
BS-DISP % dQ	-0.26
# of Decreases in Q:	43
# of Swaps in Best Fit:	0
# of Swaps in DISP:	2
BS-DISP swaps by factor	0

References:

Brown, S. G., Eberly, S., Paatero, P., and Norris, G. A.: Methods for estimating uncertainty in PMF solutions: Examples with ambient air and water quality data and guidance on reporting PMF results, Science of the Total Environment, 518-519, 626-635, 10.1016/j.scitotenv.2015.01.022, 2015.

Paatero, P., Eberly, S., Brown, S. G., and Norris, G. A.: Methods for estimating uncertainty in factor analytic solutions, Atmos. Meas. Tech., 7, 781-797, 10.5194/amt-7-781-2014, 2014.

2. Figures

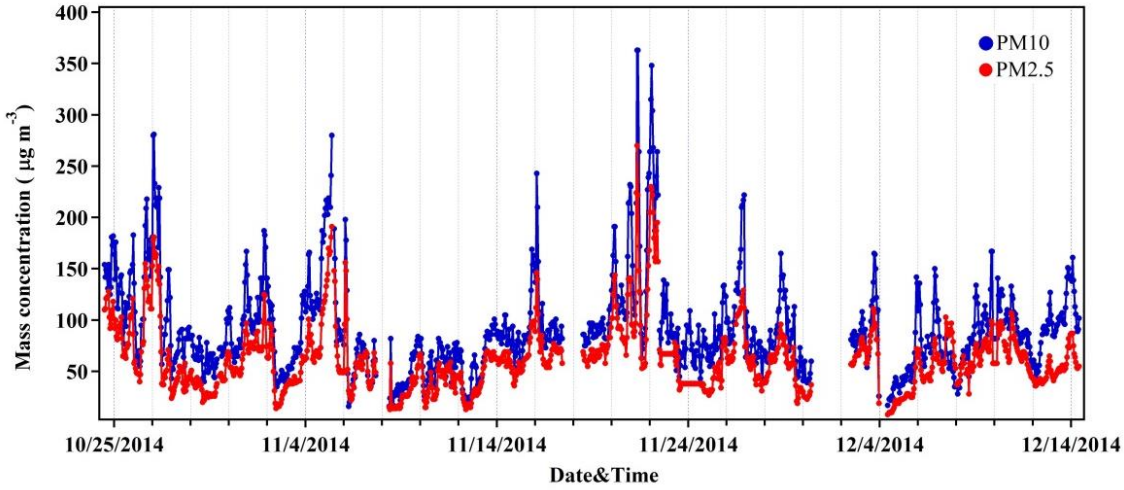
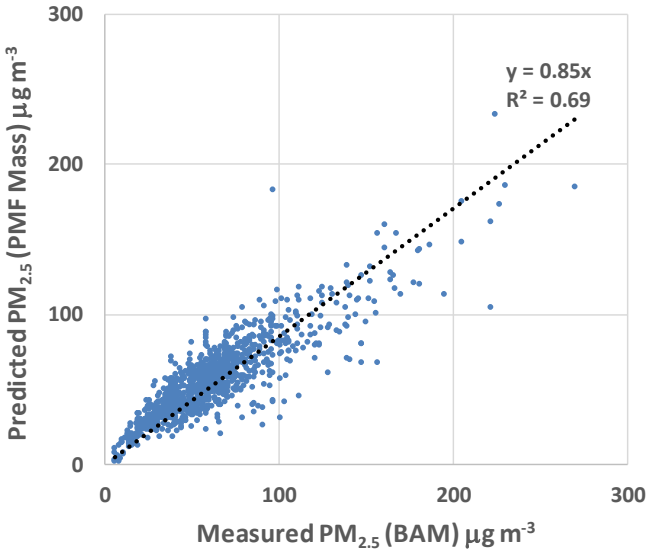
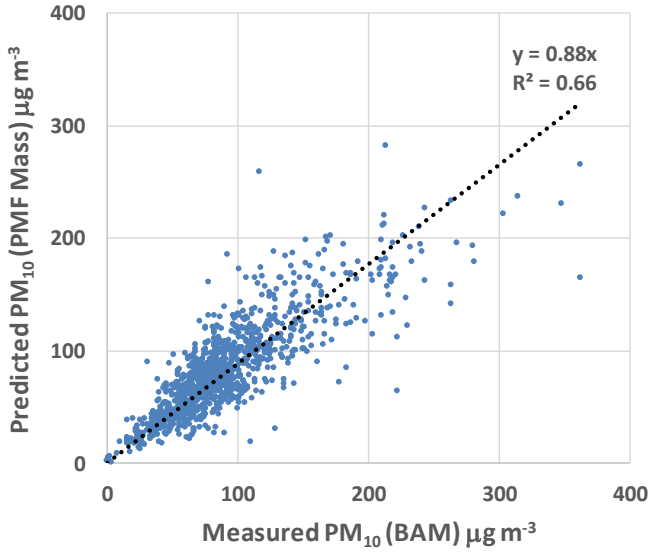


Figure SM1. The hourly variations of $PM_{2.5}$ and PM_{10} mass concentrations during the observation.

Figure SM2. Geographical distribution of fires from November 1 to 31, 2014 over southern China (https://firms.modaps.eosdis.nasa.gov/firemap/).



(a)



(b)

Figure SM3. (a) Plot of Foshan $PM_{2.5}$ predicted (PMF mass) against observed $PM_{2.5}$ mass; (b) Plot of Foshan PM_{10} predicted (PMF mass) against observed PM_{10} mass.