

Source Apportionment and Health Risk Assessment of Metal Elements in PM_{2.5} in Central Liaoning's Urban Agglomeration

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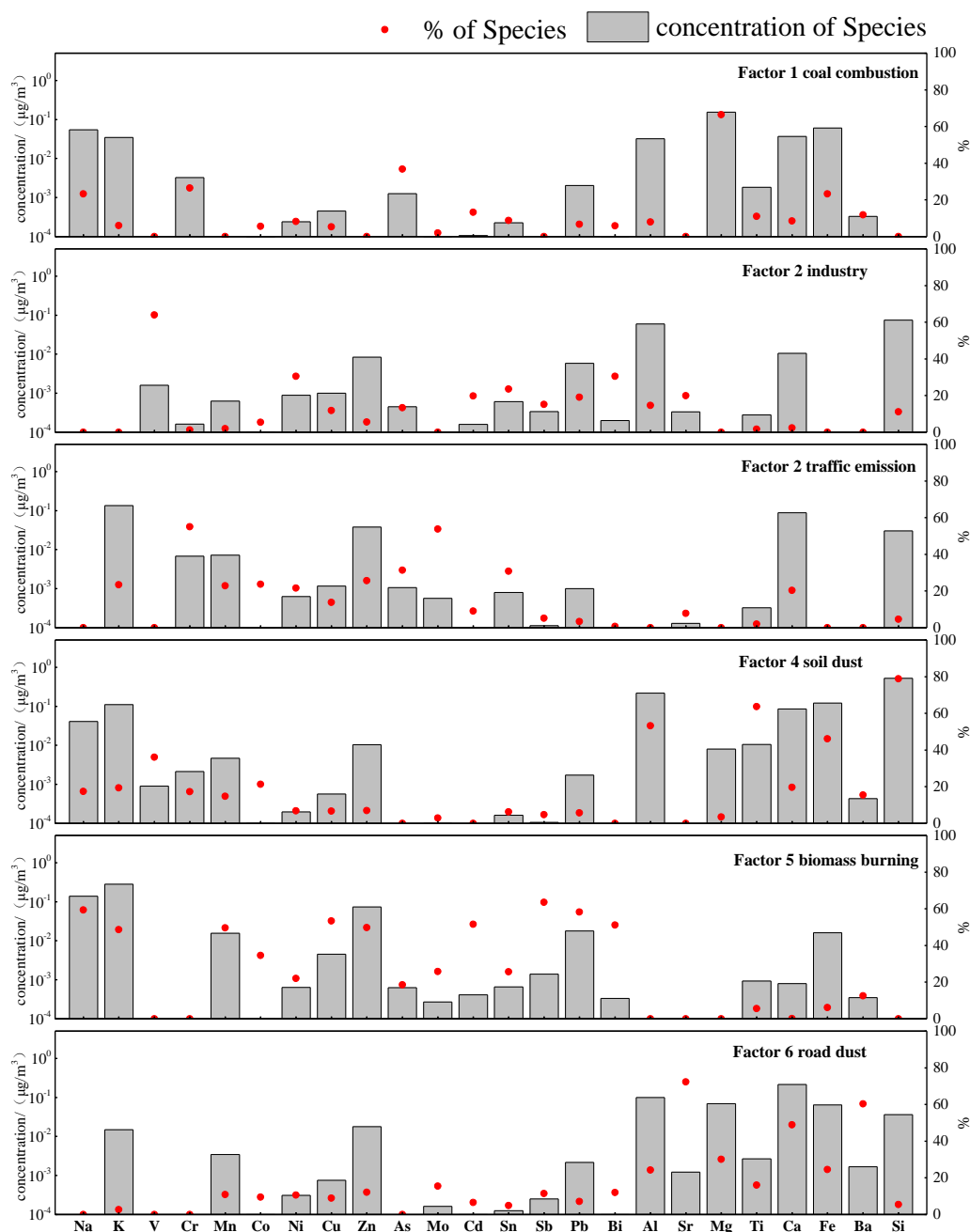


Figure S1. The source profiles of trace elements in PM_{2.5} by PMF analysis at the six cities (including Shenyang, Anshan, Fushun, Bengxi, Liaoyang and Tieling) which demonstrate the concentration and percentage of the species to each factor.

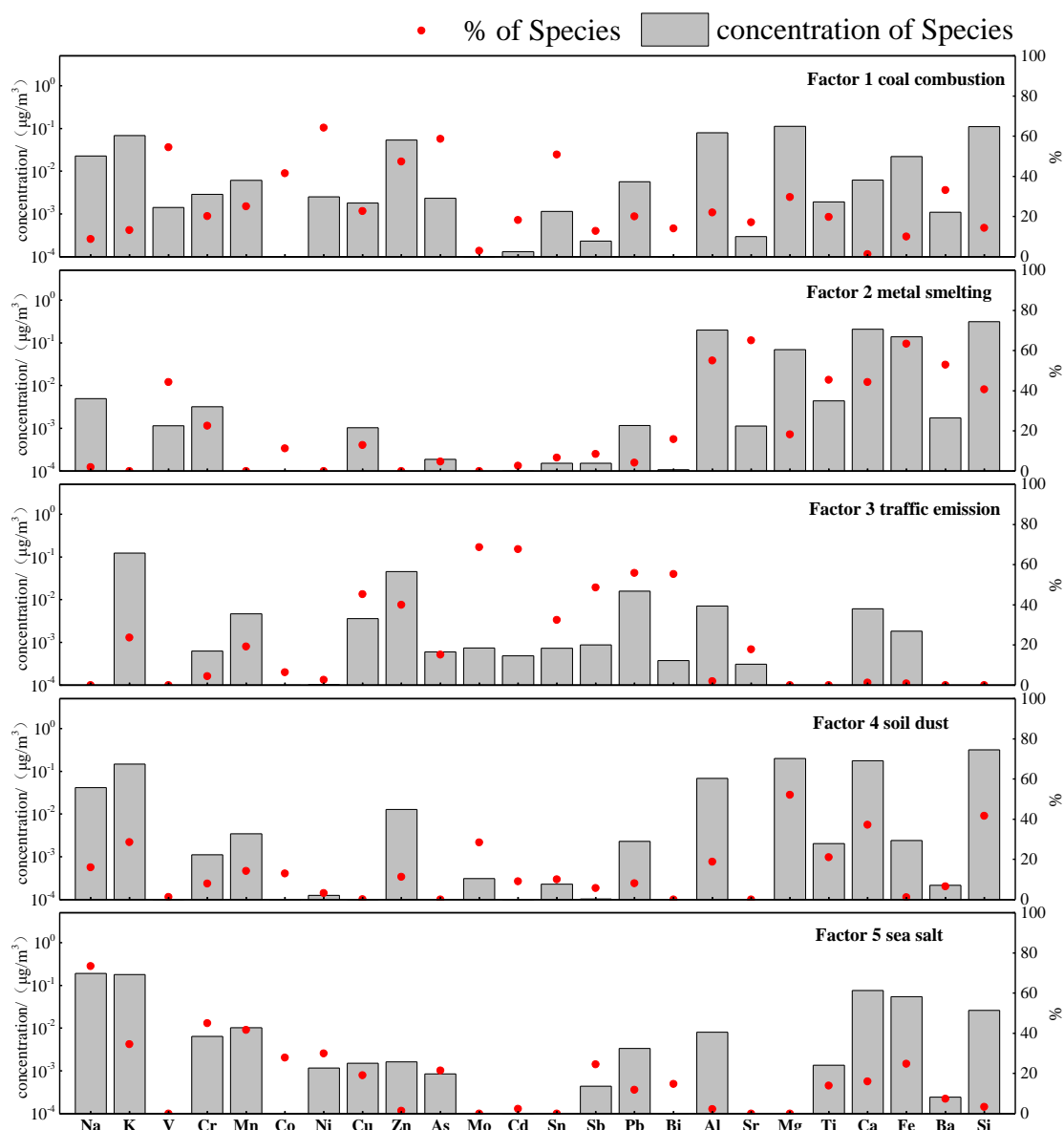


Figure S2. The source profiles of trace elements in PM_{2.5} by PMF analysis at Yingkou which demonstrate the concentration and percentage of the species to each factor.

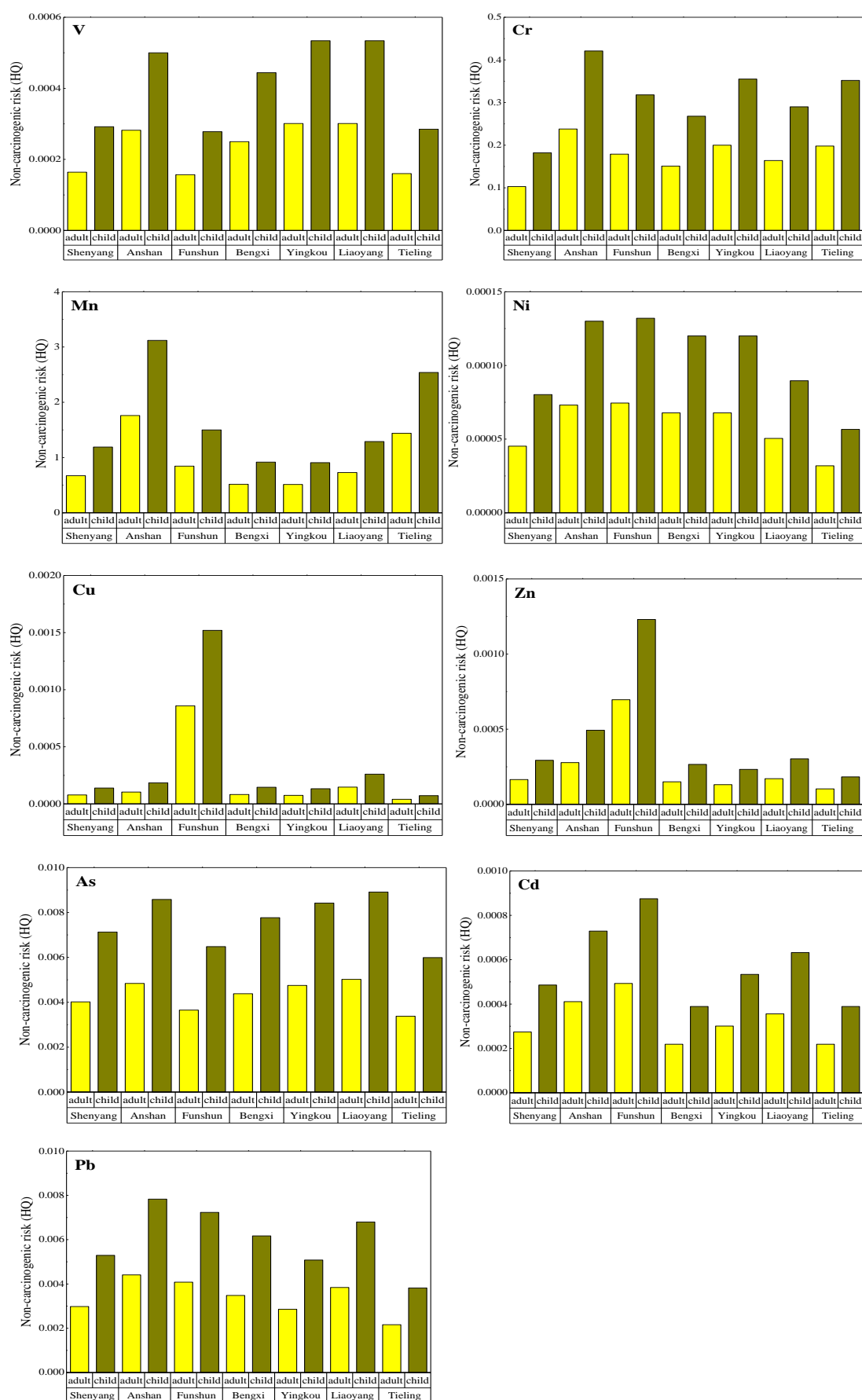


Figure S3. Non-carcinogenic risks of nine metal elements via respiratory pathway at seven cities, the yellow columns represent adult and the brown ones represent child.

Table S1. COD values of elements concentration in PM_{2.5} at different sampling sites in different cities. (a) is three sites in Shenyang, (b) is two sites in Anshan.

(a)				(b)		
Site	S1	S2	S3	Site	S4	S5
S1	1			S4	1	
S2	0.13	1		S5	0.15	1
S3	0.13	0.12	1			

Table S2. Exposure parameter values used in the risk assessment calculations.

Variable	Value	References
EF	350 days/year	(Agarwal et al., 2017)
ED	6 years for children	(US EPA (U.S. Environmental Protection Agency), 2009)
	24 years for adults	(US EPA (U.S. Environmental Protection Agency), 2009)
AT	70 year × 365 days/year for cancer risk	(US EPA (U.S. Environmental Protection Agency), 1989)
	ED × 365 days/year for non-cancer risk	(US EPA (U.S. Environmental Protection Agency), 1989)
BW	15 kg for children	(Agarwal et al., 2017)
	70 kg for adult	(Agarwal et al., 2017)
InhR	7.6 m ³ /day for children	(US EPA (U.S. Environmental Protection Agency), 1989)
	20 m ³ /day for adult	(Agarwal et al., 2017)

Note: InhR—inhale rate; BW—body weight; EF—exposure frequency; ED—exposure duration; AT—averaging time.

Table S3. The reference dose of non-carcinogenic metals and the slope factor of carcinogenic metals.

Element	V	Cr	Mn	Ni	Cu	Zn	As	Cd	Pb
Rfd(Feng et al., 2016)	7.0×10 ⁻³	2.86×10 ⁻⁵	1.43×10 ⁻⁵	2.06×10 ⁻²	4.02×10 ⁻²	0.3	3.0×10 ⁻⁴	1.0×10 ⁻³	3.52×10 ⁻³
SF(Feng et al., 2016)	-	42	-	0.84	-	-	15.1	6.3	-

Note: Rfd—reference dose; SFa—slope factor.