

Reply to Referee #2:

This paper addresses the firework contribution to haze PM_{2.5} during Chinese Spring Festival (SF) in Nanjing, China. It concluded the aging processes of FW particles influence heavily on the human health. Several comments of this paper are summarized as follows,

1) Some mistyping and incorrect words are found throughout the entire MS (e.g. "significnatly", pp. 28611. line 12; " avtivities" pp.28624. line 9). Please be sure using the word "significantly", if using, the significance testing should be done?

As the data was compared just between CNY and the day before CNY, so statistic analysis could not be done. Then we corrected it into "obviously" (for the abstract and text). We have checked the whole text and deleted "significnatly" when the comparison was just done for few data.

"avtivities" has been corrected into "activities". All have been checked by the "Find and Replace" function of word.

2) The detection limit should be listed in "Chemical analysis" for various chemical species.

The detail analysis methods and quality assurance and control for ICP-MS, ICP-OES, IC, TOR can be found in our former studies and we have pointed it in the text as "the pre-treatment and chemical analysis procedures and quality assurance and control are described detailedly in our previous works (Li et al., 2012; Kong et al., 2014a; 2014b; Li et al., 2014)". As they are both mature methods and widely used, we limited the description of them from the view of length of this paper.

To response to this comment, following information are listed.

For the accuracy of ICP-MS, geochemistry reference matter (GSS-2) made by the Center of National Standard Matter was analyzed; for ICP-OES, reference matters GBW0741, GBW07404 and GBW07406 were adopted. The analysis results are listed as the supplementary file of Kong et al. (2014a) and shown below.

For ICP-MS and ICP-OES analysis, as the limitation of equipments, we analyzed the samples in the Central Lab for Geology and Mineral in Hebei Province which belongs to the Ministry of Land and Resources of China. It is a professional analysis lab which has been assessed by General Administration of Quality Supervision, Inspection and Quarantine of China. They are familiar with analysis for trace species. The QA and QC are well established and the author believed that the data are reasonable.

Twelve blank solutions were analyzed, the detection limits were calculated as three times of standard deviation as following Table 1 shown.

Table 1 Detection limits for ICP-MS units: μg

Elements	Mean (n=12)	Detection limits (3s)
Li	0.0004	0.0002
Be	0.0002	0.0001
Na	2.5300	0.7639
P	0.0422	0.0229
K	0.9920	1.0271
Sc	0.0002	0.0001
V	0.0008	0.0017
Cr	0.0964	0.0168
Mn	0.0155	0.0094

Co	0.0004	0.0004
Ni	0.0083	0.0091
Cu	0.0437	0.0260
Zn	0.1159	0.1144
As	0.1018	0.0143
Rb	0.0027	0.0054
Y	0.0004	0.0003
Mo	0.0013	0.0012
Cd	0.0002	0.0003
Sn	0.0046	0.0011
Sb	0.0009	0.0007
Cs	0.0001	0.0001
La	0.0007	0.0040
Ce	0.0007	0.0006
Sm	0.0001	0.0001
W	0.0022	0.0069
Tl	0.0001	0.0001
Pb	0.0118	0.0054
Bi	0.0001	0.0001
Th	0.0002	0.0001
U	0.0001	0.0001

For ICP-OES analysis, twelve blank solutions were analyzed, the detection limits were calculated as three times of standard deviation as following Table 2 shown.

Table 2 Detection limits for ICP-OES units: μg

Elements	Si	Al	Ca	Mg	Fe	Ti	Ba	Sr	Zr
DL	1.39	0.95	1.07	0.16	1.21	0.18	0.011	0.004	0.085

DL: detection limits

For the accuracy of ICP-OES analysis, GBW07401, GBW07404 and GBW07406 samples were analyzed, the relative standard deviations (RSD) were listed in Table 3.

Table 3 Analysis accuracy for ICP-OES ($\mu\text{g/g}$)

Elements	GBW07401			GBW07404			GBW07406		
	Reference value	Analysis value	RSD (%)	Reference value	Analysis value	RSD (%)	Reference value	Analysis value	RSD (%)
Si	292600	291100	0.4	238100	234027	1.2	266100	263416	0.7
Al	75100	74296	0.8	124100	125240	0.6	112400	114190	1.1
Ca	12290	12329	0.2	1858	1904	1.7	1572	1560	0.5
Mg	10900	10547	2.3	2950	2868	2.0	2050	2060	0.3
Fe	36300	36910	1.2	72000	71740	0.3	56600	55824	1.0
Ti	4830	4865	0.5	10800	10574	1.5	4390	4313	1.3
Ba	590	592	0.2	213	213	0.0	118	120	1.2

Sr	155	156	0.5	77	76.5	0.5	39	39	0.0
Zr	245	234	3.2	500	511	1.5	220	211	3.0

Table 4 listed the accuracy for ICP-MS analysis.

Table 4 Analysis accuracy for ICP-MS

Elements	Mean analysis value/ μg	Reference value / μg	SD/ μg	RSD/%
Li	20.85	22	1.664	6.54
Be	1.74	1.8	0.062	3.59
Na	12094	12020	500	4.11
Mg	6024	6240	134	2.23
Al	51548	54539	1951	3.78
P	423	446	17.12	4.18
K	22541	21056	1662.8	7.84
Ca	17523	16850	864.1	4.93
Sb	1.18	1.3	0.076	6.56
Sc	9.87	10.7	0.149	1.52
Ti	2584	2710	126.7	4.74
V	59	62	2.33	3.98
Cr	49.5	47	1.80	3.63
Mn	541.2	510	15.98	2.97
Co	9.24	8.7	0.19	2.04
Ni	20.54	19.4	1.52	7.44
Cu	17.0	16.3	1.17	7.00

SD: Standard deviation; RSD: relative standard deviation

Description “the relative standard deviations between real values for standard materials and analyzing results were in the range of 1.5-14.7% and the detection limits were from 0.0001 to 1.39 μg for each element” and “The method detection limits (MDLs) for IC were 0.0258 mmol/L for Na^+ , 0.0021 mmol/L for NH_4^+ , 0.0066 mmol/L for K^+ , 0.0053 mmol/L for Mg^{2+} , 0.0030 mmol/L for Ca^{2+} , 0.0051 mmol/L for F^- , 0.0144 mmol/L for Cl^- , 0.1215 mmol/L for NO_3^- and 0.0696 mmol/L for SO_4^{2-} , respectively” could be found in Kong et al. (2014a). The MDLs for TC and OC was 0.93 $\mu\text{g C cm}^{-2}$ and 0.82 $\mu\text{g C cm}^{-2}$, respectively (Kong et al., 2012).

Kong, S. F., Ji, Y. Q., Lu, B., Zhao, X. Y., Chen, L., Bai, Z. P., Xu, Y. H., Liu, Y., and Jiang, H.: Characteristic of $\text{PM}_{2.5}$, PM_{10} and TSP source profiles for fugitive dust in a coastal oilfield city, China, *Aerosol Air Qual. Res.*, 14, 2017-2028, 2014a.

Kong, S. F., Ji, Y. Q., Lu, B., Bai, Z. P., Chen, L., Han, B., and Li, Z.Y.: Chemical compositions and sources of atmospheric PM_{10} in heating, non-heating and sand periods at a coal-based city in northeastern china. *Journal of Environmental Monitoring*, 2012, 14: 852-865

3) Please add" (Fig.4)" to the line 15 of PP.28623 when describing the data.

It has been added in line 361.

4) PP.28623, line 22: Please show the unit of the wind speed.

It has been added in line 365.

5) The inconsistent data are found in the line 8 of PP.28625 (33.7) with the data in Table 1 (37.7).

We have checked the data and sorry for this pencil error. It has been corrected as 37.7 in the text (line 407).

6) English should be polished by a English native speaker.

We have polished the paper for another three times and ask for help of an expert at this field with more than eight years research experiences in UK.