

## ***Interactive comment on “First long-term and near real-time measurement of atmospheric trace elements in Shanghai, China” by Yunhua Chang et al.***

**Anonymous Referee #5**

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This paper presents a full year of temporally highly resolved data (1h resolution) of trace elements in PM2.5 as measured in Shanghai (China) using an on-line multi-metal monitor (XRF instrument Xact625, Cooper Environmental). This data is evaluated by applying different statistical methods in order to find correlations between the different elements and evidence of common sources. The article presents probably the longest time series of hourly trace elements in PM2.5 so far, and highlights the situation in the largest megacity and a main industrial center in China, where emissions are expected to be high. The article is therefore of high interest, it is reasonably well written (see comments below) and certainly deserves publication in Atmospheric Chemistry and Physics. However, the manuscript needs some re-revisions as detailed in the comments

C1

below:

1. Abstract: The abstract is much too long and needs to be shortened. Only the most important results should be mentioned in a short and concise way.
2. Although not a native English speaking person, I find the English is of variable quality. Abstract and introduction are well written, the other sections need careful revisions. Especially the Statistical analysis section has many linguistic and semantic errors. Examples are the lines 256-258, “The “corrplot” package in R is a graphical display of a correlation matrix, confidence interval. It also contains specific algorithms to do matrix.”, and lines 278-279, “The corrplot package can draw rectangles . . .”. Please revise the text carefully.
3. The results of the principal component analysis and also the hierarchical clustering do not bring any new insights that go beyond the analysis of pairwise correlations together with CPF and BPP. Section 3.2.2 is not well written and does not give any new information, the discussion about the number of selected clusters appears arbitrary. Moreover, the discussion of the method applied for hierarchical clustering is not sufficient. It remains unclear what exact method has been applied. If it is decided that the results of this data analytical method can remain in the article, then a detailed description of the applied method is required. I suggest to skip section 3.2.2, as it does not provide any new insights and it is also not well written. The paper will certainly benefit from being shortened (the authors could mention in the paper that PCA and hierarchical clustering were applied, but the results did not lead to additional information).
4. Figure 5 is rather suspicious. The sharp peaks in Cd and Ag at 1am local time are hard to believe. The authors should check again, if there is not another, maybe operational explanation. In Figure 6, normalised wind does not make much sense, should be removed from the graph. Figures 8-11 are of the same type than Figures 5 and 6. They can be shifted to the Supplement.

C2

Additional comments:

Lines 98-99, Sentence should be changed to e.g. "Typical ambient trace metal sampling devices collect 12 to 24-hr integrated average samples, which ..."

Line 105, "may be orders of magnitude lower than ...". It can easily be estimated that it cannot be orders of magnitude or max 2 orders for 15min samples. Rewrite accordingly.

Lines 152-153, "Meanwhile, most available source evidences were inferred based on filter sampling and off-line analysis, which were not necessarily representative of actual origins." I don't understand this sentence, it is probably not correct. Please rewrite.

Line 219, please be more precise, should be "glass fibre filters".

Line 229, should be "spectrometer".

Lines 242-244: "As data in the current study were collected in near-real time, the importance for quality assurance and quality control (QA/QC) system can be crucial in order to improve data quality throughput." All measurements independent of time resolution require an appropriate QA/QC. This sentence makes in the present form no sense and should be deleted or revised.

Lines 294-296, sector. "CPF analysis is capable to 295 show which wind directions are dominated by high concentrations and give the probability of doing so." Poor English, please rewrite.

Lines 330-331: The statement that "airborne metals pollution in Shanghai is generally low by the current limit ceilings" is difficult to see from the text, maybe add a table (could also be in the Supplement).

Lines 373-375. "Globally, anthropogenic emissions of Ag and Cd exceed the natural rates by well over an order of magnitude\*. Please give a reference for this statement.

Line 562, legend of Figure 12, and at elsewhere in the text. The authors mention "sig-

C3

nificant corre-lations". It should be explained how significant correlations are defined, how has significance been calculated, what kind of statistical test has been applied.

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C4