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Atmospheric Chemistry and Physics
Discussions

Interactive comment on “PM$_{2.5}$ water-soluble elements in the southeastern United States: automated analytical method development, spatiotemporal distributions, source apportionment, and implications for heath studies” *by* T. Fang et al.

Anonymous Referee #1

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This paper describes extensive measurements of water soluble elements in PM2.5 aerosol in the southeastern US. This work is a tour-de-force in terms of the numbers of measurements (500), which permit analysis of spatial homogeneity and seasonal dependencies. For the most part, the measurements were made by a commercial x-ray fluorescence system, along with some measurements of WSOC using a TOC analyzer. In particular, samples were collected on filters and then solubilized and atomized, before being directed to the analyzers. The authors do an extensive characterization of the efficiency of detection of elements from solutions of known concentrations from which they extract a correction factor applied to their data. They also compare sulfur analyzed by ion chromatography to that measured by XRF. All-in-all, the analytical measurements are first-class, made by a group known for its experimental rigor. The data are analyzed largely by PMF (along with some COD work) and a good justification of a four-factor solution is given in the Supplementary Information, including illustration of the size of the residuals for each element.

I think this is an excellent study and I highly recommend publication.

My comments are all relatively minor:

Are there any analytical matrix effects associated with the XRF detection, i.e. presence of one element affecting the signal from another? With this being XRF, I would not expect so but just wondering if the authors examined this?

I am puzzled why some elements were given a value of 0.5 of LOD when they were not detected, for the PMF analysis. Why not give them a value of zero? Does this affect the PMF solutions?

Can the WSOC data also be presented, for example in Figures 5 and 6?

Lastly, is there a way to substantiate the suggestion that some elements (e.g. those in dust) are higher in summer periods because the weather is drier? In particular, is there a way to summarize or incorporate the meteorological conditions into the analyses? e.g. lower dust or break/tire wear after precipitation? Higher sulfur after high pressure times, etc?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 17189, 2015.