

## ***Interactive comment on “Sources, solubility, and acid processing of aerosol iron and phosphorous over the South China Sea: East Asian dust and pollution outflows vs. Southeast Asian biomass burning” by S.-C. Hsu et al.***

### **Anonymous Referee #3**

Received and published: 20 September 2014

**General Comments** This manuscript provides insights on one mechanism governing iron solubility in aerosols impacting the South China Sea. The authors provide support for the acid processing hypothesis with respect to iron and to some degree phosphorus through the use of linear and power law relationships. Through these correlations, the solubility of iron is shown to be dependent on the acidity of the aerosols rather than the source region. Acidity is also shown to affect the solubility of phosphorus, but to a lesser degree. This information is valuable but is not well presented in the manuscript. Arguments are often difficult to understand. Before this paper could be accepted for

C7293

publication, there are some issues that should be addressed.

**Specific Comments** The authors are examining phosphorus and iron side by side. If they choose to keep this format, an explanation of why should be included in the introduction.

The introduction cites previous studies conducted using single particle analysis that have provided evidence of atmospheric processes in East Asian outflows. It is worth mentioning that these relationships are not limited to just East Asian outflows. Oakes et al. 2012 conducted single particle analyses with similar findings for urban aerosols.

This study examines the effect acidity on aerosols from two distinctive sources. However, the authors recognize that there are many factors including Fe and P speciation and other atmospheric processes that could still be playing a role in the solubilization of these micronutrients, thus the authors didn't necessarily prove that acid processing alone enhanced Fe and P dissolution but did provide evidence.

There is not a lot of detail provided on the sampling and analytical procedures. I recognize that the authors cite a reference for more detailed methods, but the basic details should still be provided.

Throughout the paper there is often information that seems extraneous. Here are a few examples. In the concluding remarks, there is a discussion of organic complexation. As the authors offer no additional insights on this topic, it feels out of place. The same applies to the North Atlantic Ocean.

In this case it might be better to separate the Results and Discussion. For example, the lengthy discussion of temporal distributions did not seem to add a lot of interesting insights to the paper. This could be because it was written mixed with extensive comparisons to previous studies, and the point you were making got lost. If these were separated into a Results (the variations) and Discussion (the comparisons), then the ideas being conveyed in both would be more clear.

C7294

The implications and concluding remarks do have a number of interesting points such as the potential of aerosol acidity to mobilize aerosol Fe in paleo time-scales. These thoughts got lost and often weren't fully developed. The authors should focus on the implications that their data really supports.

Technical Corrections The authors should try to be more succinct. Often the basic thought that is being conveyed gets lost in transitional words and additional explanations.

Take out the Wikipedia reference.

The text on Figures 3 and 6-10 is much too small.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 21433, 2014.