**Atmospheric
Chemistry
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Discussions**

Interactive comment on "**Chemical and microphysical properties of the aerosol during foggy and nonfoggy episodes: a relationship between organic and inorganic content of the aerosol**" *by* D. S. Kaul et al.

Anonymous Referee #2

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This study applies PMF analysis to measurements of aerosol particle chemical composition in Kanpur, India during winter 2010. It also describes changes in the microphysical properties of aerosol particles between foggy and clear episodes. This paper is poorly written, poorly organized and confusing. The conclusions are vague and not supported by the data presented in the paper. This paper needs major revisions before it can be published. I will give general comments that I hope will help the authors refocus and better organize the paper. Since the paper needs a major rewrite, it is not worth identifying at this time all the specific instances in the text and figures that

need correction. Comments: 1) The introduction is wordy and contains numerous inaccuracies (e.g., oligomers are not the same thing as organo-sulfates, accumulation mode particles do not evolve solely from evaporation of cloud droplets). I would suggest deleting the entire introduction, rewrite the rest of the paper and then rewrite the introduction to contain information that is relevant to the information in and conclusions of the paper. 2) This paper needs to be refocused on the PMF results. The data used in this paper has been published previously in Kaul et al. (2011). Therefore, it is not necessary to go into so much detail about the experimental measurements (Section 2). It is also not necessary to present time trends for all the species. Figures 1, 5, 6, 7 could be skipped. The size distributions (Figure 8) were not presented in Kaul et al. (2011) and could be included here, but the time trends (Figure 9) are not useful information. 3) One of the main points of this paper is the application of PMF to the data, but all the PMF results are buried in the supplementary information. I think these figures should be moved to the main part of the paper. 4) The authors have a basic misunderstanding of what PMF provides. It identifies chemical components that co-vary in time. It does not give sources. If you want to claim that your factors correspond to different sources then you need to provide additional information. For example, does the F1 factor have the same chemical composition as measurements of aerosol particles from a biomass burning source? Does the F3 factor (secondary source) correlate with O3 or SO2? Does it correlate with calculated SOA? What do you mean by refractory source (factor F2) and how is it different than mineral dust (F4)? What is your evidence that this chemical composition corresponds with this source? Also, looking at the time trends for the relative contribution of the different factors, there does not appear to be any difference between foggy and clear conditions for any of the factors. This is inconsistent with the conclusion in the abstract that biomass burning aerosols are preferentially scavenged by fog droplets. 5) Figure S9 is difficult to interpret. Use the same x-axis for both panels and use the same log y-axis for both panels. It would be helpful to add a line at y=1 to show the change from droplet growth to droplet evaporation. 6) In Figure 8, the foggy episodes have a higher total particle count and a larger particle diameter. This

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is not consistent with the statement in the text (Section 3.3) that PM1 mass loading was lower during foggy episodes (although the foggy and clear mass loadings are well within each other's error bars). 7) Once the basic structure of this paper is corrected, it needs to be carefully edited by a native English speaker. There are many incorrect and extremely awkward usages of the English language that make the paper even more confusing than it might otherwise be. Another source of confusion is that the authors do not clearly state when they are presenting chemical composition of aerosol particles and when they are presenting results for collected fog droplets. The source of the data needs to be clear in each paragraph and in each figure caption.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 14483, 2012.

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