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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigation of aged aerosols in size-resolved Asian dust storm particles transported from Beijing, China to Incheon, Korea using low-*Z* particle EPMA" *by* H. Geng et al.

Anonymous Referee #1

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Review of "Heterogeneous aging of Asian dust storm particles transported from Beijing, China to Incheon, Korea" by Geng et al. Overall the paper presents a very detailed analysis of individual Asian dust particle composition as measured by EPMA. The topic of this paper does not bring any new major ideas to the current knowledge of atmospheric chemistry. It has been known for years that Asian dust undergoes heterogeneous processing. The authors seem to want to use Mg/Si or Mg/Al ratios as "indices of the ageing process", but offer no insight as to why this may be of use. This result is highlighted in the abstract, results, and conclusions but offer no mechanism

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why the Mg/Si or Mg/Al ratio should change. In order for this manuscript to be published in ACP, I think the authors should thoroughly re-think the focus of the paper if they cannot provide solid reasons why the Mg/Si or Mg/Al ratios change in the manner that they do. The only way that one of the ratios would change is if 1) one element was preferentially deposited 2) the Mg, Al or Si volatilized (doubtful) 3) there were different source contributions or, 4) there is coagulation with sea salt. Based on the sentence on line 379, the authors imply that a chemical reaction is responsible for changing the Mg/Al or Mg/Si ratio. The authors need to be more specific here. What kind of chemical reaction is expected? The authors should address these scenarios and indicate which is more likely. The authors should highlight the implications of their findings. How robust do they believe this metric will be? Can the results of this isolated study be applied to other studies to advance our understanding of heterogeneous processing? The paper is technically well put together and is most likely within the scope of ACP. I have a few other minor comments below: Abstract, line 33: The authors should state why fine mode K-containing particles are important. An indication of the abundance of these particles should be added to the abstract. Abstract, line 44: By how much did the Mg ratios change? Standard error should be given with these ratios. Line 264: Instead of preceding the list with "they are" simply place a colon after the sentence followed by a numbered list. Line 312 and throughout the manuscript: Use "unreacted" or "fresh" opposed to "genuine" Line 352-353: What kind of percentage is this? By number or by mass? Atomic % may be a more interpretable number opposed to the mass of Mg-containing species. Line 441: Remove "the" from the section heading. Line 472: is there any way to use elemental composition to bolster the claim that the fine mode NaCl was from dry lakebeds? Why would these particles be smaller (they are on stage 6) than sea salt? Another possibility is an industrial source. Line 495: change "they have much less abundance" to "they are less abundant" Line 557: Change "This" to "These". Figure 2: Indicate which city/country the different samples were taken. This should be done on this figure or in the legend.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 27971, 2013.

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