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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modes in the size distributions and neutralization extent of fog-processed ammonium salt aerosols observed at Canadian rural locations" *by* X. H. Yao and L. Zhang

Anonymous Referee #2

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This paper reports the size-resolved inorganic chemical composition of particulates in air samples from a number of Canadian sites, collected with a MOUDI. The focus of the paper is upon the identification of fog-processed air from specific super-micron modes in the size distributions. There would be merit to a large collection of air particulate samples that had experienced fog processing, to learn how this mechanism may affect the size-resolved chemical distributions. Indeed, to have such distributions before, during and after a fog event would be of considerable value. Unfortunately, this study is limited by a very small number of fog samples (ten) and so major conclusions are hard

to make. Also, the paper is extremely poorly written, to the point that once one starts to read the Results and Discussion section, it is frequently not possible (for me) to determine what the authors are discussing. As an example, the Abstract starts with a statement that "192 samples" were collected but it does not state what the samples are of (line 2). Are these particulates collected during fogs, in clouds, or in clear air? In what way do the large supermicron particle modes indicate fog processing (line 5)? I cannot understand the sentence between line 8 and line 12. For example, what is meant by "ammonium sulfate incompletely neutralized"? If ammonium sulfate is present, then it is completely neutralized. However, the Abstract is much easier to read than the Results and Discussion section which is almost incomprehensible. For example, on page 5525, line 6 what is the SPR site? The logic in the sentence starting at line 3, page 5526 is not obvious. I do not know what is meant by the sentence on line 15-17 on page 5526, nor that at line 20-22 on page 5526. And so on, throughout the paper. For this reason alone I recommend that this paper be rejected. The issue is not only one of facility in English but clarity of thought

Other points:

1. The figures are in such a poor form that it is extremely difficult to read the plots

2. I am sceptical that any firm conclusions can be made with respect to different fog compositions collected under freezing conditions (T<273K) and non-freezing conditions. Only 10 samples were collected in total of which only 3 were in the freezing domain, so the statistics are poor. Also, the temperatures are only just below 273, and so it is unlikely the fog droplets will have frozen. Finally, how can different meteorological conditions be ruled out as the cause of different size-resolved compositions, if they are indeed observed?

3. On that topic, no meteorological analyses were presented for the different samples. Where was the air coming from for each sample? How may its provenance affect the sample?

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Interactive Comment

4. What is the experimental uncertainty in the relative acidity value? For example, how significant are the data if that ratio is just above or just below unity?

5. Should there be a factor of two in front of the sulfate quantity in the equation on page 5524. This is another example of technical issues – i.e. there should be an equation number associated with this equation. Also, the equation should use symbols to express that these are concentrations, not simply have the quantities written as NO3-, Cl-, etc.)

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 5519, 2012.