

## ***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***

**L. M. Russell (Editor)**

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Editor's Comment: I have now received the following additional comments from a 3rd Referee who was unable to make the initial deadline. Please take the opportunity to address these additional comments in your responses and revision.

===== Referee 3 Comments

Review - Yao and Zhang ACP 2012

In my opinion, the fundamental problem with this work is that the authors discuss their  
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results of sampling with a MOUDI under fog conditions as being “fog-processed”, and the discussion and analysis of the physics and chemistry of the particles appears to be based on that assumption. Based on the results presented in the figures, I believe that the authors sampled fog droplets directly in the 10 cases they describe, and that the concept of ‘fog-processed’ is misleading as it implies that most of the water was removed from the droplets prior to sampling with the MOUDI. The differences are not subtle, and the resulting interpretations can be very different. The authors need to carefully consider what the samples represent, discuss the sampling in a clear and concise manner, and then re-evaluate their results taking into account how fog droplets are sampled with a MOUDI; they are likely not significantly dried in the MOUDI. At this time, the paper is not suitable for publication in ACP.

Some specific comments:

Abstract - There are only 10 of 192 samples defined as fog processed, and you separate those 10 among coastal and inland as well as between temperatures above and below 0oC. The abstract needs to indicate the durations of the 192 samples (1 day, 1 week, ...?) and how many of the 10 fog-processed samples collected at <0oC.

P 5521: P 5521, lines 5-7 - Deposition will remove particles, but what are left are as easily characterized as any others, are they not? P 5521, line 10 - by "enhanced particle pollution", do you mean increased mass or number? P 5521, lines 10-21 - I do not get a clear picture from this paragraph as to how the result of fog processing is viewed. Are you saying that fog processing increases the number concentrations of particles or just makes particles larger? Are you saying that how fog processes aerosol particles depends on the initial number concentration of particles? P 5522, lines 5-10 - what was the duration and frequency of sample collection? P 5522, line 22 - The lines in Figure 2 are difficult to see. P 5522, lines 22-23 - statistically different in what sense? P 5522, line 19 - p 5523, line 8 - You start by inferring that the supermicron mode in 10 samples was due to cloud processing, and then you identify that as your hypothesis. But then you apparently dismiss that hypothesis for the reasons identified as 1 and 2?

What are trying to say here? P 5524, lines 11-25 - While instances of "frozen fog" may occur at temperatures above -12°C, it is not uncommon for clouds and, by extension, fog to supercool. But if ice fog existed rather than liquid fog droplets, the cloud particle distribution will be much different. Thus, the temperature effect you imply will be partly due to changes in chemical rate constants and partitioning and partly due to the fact that your cloud particle distribution is completely different. P 5527, lines 26-28 - I don't see 30 um in Figure 3.

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

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