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Interactive Comment

Interactive comment on "Comprehensive airborne characterization of aerosol from a major bovine source" *by* A. Sorooshian et al.

A. Sorooshian et al.

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We thank this reviewer for thoughtful suggestions and concerns. We provide our responses to each of the comments below.

Specific Comments Page 10428, lines 10-11 and page 10429, lines 2-3: In Figs. 7 and 8, the locations considered to be in plume are not clear. Addition of guides to eye (e.g., plume area or wind direction) in the figures might be helpful for readers to understand that nitrate, ammonium and total organics in the plume were higher than those in the background valley aerosol.

***Response: We originally intended to first make it clear where the plume locations were in Figure 1 (we indicate where the plume source is and show the wind direction in addition to plume ages). However, we have now also added arrows to Figs. 7 and

8 to show what direction the wind was blowing the plume (we already provided arrows showing where the plume source is in Figs. 7 and 8).

Page 10429, 2nd paragraph: Although authors explained that one of the characteristic peak of amine is at m/z 73 (Sect. 2.2), m/z 74 instead of m/z 73 is discussed in this paragraph. While the points of m/z 58 are tagged in Fig. 11, they are not explained.

***Response: We thank the reviewer for catching this. We have corrected the text and Fig. 11 in such a way to only discuss the following amine markers that show a clear increase in signal within the plume (m/z 30, 56, 86).

Page 10433, lines 26-28: The relationship between the hydrophobic organics and the retardation of droplet growth is reported as a major finding, as the authors describe it both in the abstract and the conclusion section. However, it is very difficult for readers to find a tendency from the color coding in Fig. 18. The evidence of the tendency should be presented in a clearer manner (e.g., correlation coefficients, or x-y plots without color coding).

***Response: We have included correlation coefficients in Fig. 18 and near the end of section 3.6.2 in order to address this issue. We highlight in the text that the tendency towards retardation of droplet growth as a function of hydrophobic organic material is weak, which is clear from the presented correlation coefficients. We also reword our statements in the abstract and conclusions to say that hydrophobic organics may have possibly retarded droplet growth via kinetic effects, although the tendency is weak based on the results of this study.

Page 10437, lines 9-11: Is this statement based on the results presented in Figs. 7, 8, and 10? If so, these figures should be referred to in the text. Further, in Figs. 7 and 8, it is not clear that ethylamine and diethylamine concentrations decreased as a function of plume age. The data points indicating the decreasing trend may need to be explained more specifically.

***Response: The statement is based mainly on data from Fig. 10. After further review, we agree with the reviewer that the trend is not clear from Figs. 7 and 8. We have edited this sentence to address this issue.

Page 10439, lines 4-6: Most readers may not know that the m/z 57:44 ratio of 0.07 suggests that the aerosol was highly oxygenated. More explanation, for example on the m/z 57:44 ratios of HOA and OOA, may be necessary.

***Response: We have added text to provide representative values of the m/z 57:44 ratio in oxidized and polluted atmospheres based on separate measurements by various AMS instruments.

Page 10439, lines 18-23: It is explained that lower organic acid contributions are likely not a result of less photochemical processing. However, if the aqueous phase processing includes photochemical reactions, it can be said that photochemical processing is less when the aqueous phase processes are prevented.

***Response: We have revised these lines to address this issue.

Page 10440, lines 10-13: Fig. 5 should be referred to in the sentence.

***Response: We have added the figure reference at the end of this sentence.

Page 10440, lines 24-26: Figures corresponding to this explanation should be referred to in the sentence.

***Response: We have added figure references.

Page 10441-10443, Sect. 4.5: The size ranges of aerosol particles in the closure study are not explained. If the closure is for particles with dry mobility diameters between 150 and 200 nm (Sect. 2.3), how are the data with different representation of particle diameters (e.g., vacuum aerodynamic diameter versus mobility diameter) compared? What are the assumptions of this closure for the externally-mixed aerosols observed (Fig. 12)?

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***Response: The size range of particles in the closure study was 150 – 200 nm (mobility-equivalent diameter). For the closure calculations, the bulk composition data (composition of particles between ˜50 nm and 800 nm) from the C-ToF-AMS are used. Since there was clearly an external mixture, converting from vacuum aerodynamic diameter (C-ToF-AMS) to mobility-equivalent diameter is quite difficult. Nitrate salts typically have significantly higher densities than organics and would shift more than organics when converting from Dva to Dm. Of course if there was an internal mixture, one would not have to worry about this issue (DeCarlo et al., 2004). We decided not to attempt to determine which composition measurements from the C-ToF-AMS correspond to particles with mobility diameters between 150 – 200 nm because of the uncertainties in the mixing state and densities of measured particles and the corresponding uncertainty in how much to shift each species to convert from Dva to Dm. Instead we chose to use bulk composition since it provides a reasonable average and will be fairly accurate for the majority of the distribution. We thank the reviewer for bringing this up and we have added text to the paper to address this issue. We state that we are assuming an internal mixture for the closure calculations although we know this is not the case.

DeCarlo, P. F., Slowik, J. G., Worsnop, D. R., Davidovits, P., and Jimenez, J. L.: Particle morphology and density characterization by combined mobility and aerodynamic diameter measurements. Part 1: Theory. Aerosol Sci. Tech., 38, 1185-1205, 2004.

Page 10441, Eq. 2: Are the dimensions of the both sides of the equation the same?

***Response: Equation 2 has been corrected.

Page, 10443, 7-9: It is an unexpected result that the normalized CCN activation ratio at 0.25% SS was much higher than those at 0.35% and 0.4-0.6% SS. An explanation to this point is necessary.

***Response: The data do indicate that the normalized activation ratios at 0.25% SS tend to be higher than normalized activation ratios at higher supersaturations. We

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do not have a clear explanation for this, therefore, we do not make any assertions in the text. Potential explanations include relatively more activation at 0.25% SS during the times of flight when the measurements were made and the spatial location of the measurements. It should be noted that there were more data points available at 0.25% SS. We believe a more important issue is the relationship between the subsaturated growth factor and the normalized CCN activation ratio. In this regard we wanted to show that the data for each supersaturation tend to show a positive relationship between normalized activation ratio and subsaturated growth factor. We add text to discuss all of these points.

Page, 10444, Sect. 4.7: One of the advantages in using _ may be that this parameter for each component is additive. The _ values for the organic fraction are worth calculating based on the growth factors presented in Sect. 4.5.

***Response: These values have been calculated and incorporated into Table 4 and the text.

Captions of Figs. 7-8: The concentration of ethylamine is presented in the figures but it is not explained in the captions. Marker sizes are not explained, either.

***Response: The captions have been revised.

Technical correction Fig. 11 caption: The letter "b" in the second line should be capitalized.

***Response: The letter B has been capitalized.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 10415, 2008.

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