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Atmospheric Chemistry and Physics Discussions



# *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 his insightful comments and suggestions. Our responses follow the comments made below.

Detailed comments: 1. The PILS includes upstream denuders to remove acidic and basic gases from the sample stream so that they do not contaminate the PM measurements. Under normal sampling conditions these denuders have been shown to work quite well. Unfortunately, the plume that is the topic of the current study is anything but normal. Gas-phase concentrations of ammonia and amines can be expected to be many times larger than normal, raising the possibility that some material broke through the denuder. It might be the case that the authors have the data to evaluate this potential problem. I would urge them to highlight this quality control metric in the manuscript.



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***Response: We thank the reviewer for this thoughtful comment about the quality control issues associated with denuder breakthrough. We already provided details regarding the denuders used in the PILS system and highlight that the same exact denuders have been shown to remove gaseous amine species in a laboratory chamber study (Murphy et al., 2007). This latter study consisting of a chamber containing between 50 - 500 ppb mixing ratios for the different amines studied (these are estimated initial mixing ratios). We argue that the good performance of the denuders in removing amine vapor breakthrough in the chamber experiments support the validity of our particulate amine measurements. The detection of amine markers by the C-ToF-AMS also provides support for our PILS amine measurements as this mass spectrometry technique is an independent measurement which does not suffer from any type of positive artifacts from vapors.

The larger issue is probably associated with the potential for ammonia breakthrough. Using the PILS and C-ToF-AMS datasets, we compared ammonium concentrations to see how the ratio varied with time (in and out of the plume). For this comparison, we averaged C-ToF-AMS data over the interval of the collection time for each PILS sample. If this ratio is relatively constant, this gives us some confidence at least that there was not breakthrough during the times sampling took place directly in the plume where ammonia concentrations were presumably the highest. The average of the ammonium ratio (PILS:C-ToF-AMS) was 0.90 +/- 0.11 during flight A and 0.87 +/- 0.21 during flight B. We have provided lengthy discussion in the paper about these calculations and how it appears as though ammonia breakthrough was not a major issue.

2. The aerosol concentrations measured in the current study are quite modest compared to the measured PM2.5 concentrations that occur during winter stagnation events. PM2.5 concentrations exceeding 100 ug/m3 were measured widely throughout the San Joaquin Valley during the CRPAQS field study (winter 2000-01). Gas-phase measurements of ammonia and nitric acid were made during that campaign, confirming the hypothesis that a great excess of ammonia exists over nitric acid during winter



**ACPD**

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stagnation events. That doesn't mean that amines didn't neutralize 14-23% of the acidic PM during the current modest campaign, but it does suggest that caution should be used when extrapolating the current results to a more severe pollution event.

***Response: We thank the reviewer for this comment. We agree that caution should be taken when extrapolating conclusions from the current study to more severe pollution events, especially winter stagnation events in the San Joaquin Valley. We have revised the appropriate text in the paper in order to address this issue.

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