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Interactive comment on “The unique properties of agricultural aerosols measured at a cattle feeding operation” by N. Hiranuma et al.

Anonymous Referee #1

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The paper discusses the physical and compositional properties of particulate matter in a cattle feedlot in Texas. In particular, size distribution data and single-particle Raman spectra are discussed with a focus on implications for the local and regional air quality. The paper is well written and the discussion is succinct but fairly comprehensive and in my opinion deserves publication with only minor revisions. The scientific significance is high and the quality of the work is very good and well documented, the Raman single-particle analysis is particular interesting. Some general and some more specific comments are provided below.

General comments: 1) The authors mention “visibility, radiative properties, climate. . .” in addition to air quality, as motivations for their study -throughout the manuscript- but most of the discussion is focused on the air quality aspects of it and no discussion

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seem to have been developed for quantifying the potential effects on visibility, radiative properties and climate. Although I agree this might be beyond the scope of such paper, the data-set would be quite useful for estimating the impact on climate and visibility, especially having chemical composition and mixing information in addition to size distributions. Maybe the authors should explain at the beginning that, although this has implication also for visibility, radiative properties and climate, the discussion in this paper is focused on air quality. 2) The compositional data and the mixing state information are extremely interesting, but it seems to me that there is little discussion on the implications of these data and findings for either air quality, radiative properties or climate (with the exception of the briefly mentioned effect on hygroscopicity). Maybe the authors could consider expanding a little bit this discussion and explain the possible implications. 3) Although, this might be beyond the scope of the study, additional electron microscope analysis (e.g. SEM) of the collected particles could have helped elucidating the distinction between black and brown carbon and provide useful additional information.

More specific comments: 1) Abstract - Line 7: “nominally” what does “nominally” really indicate here? - Lines 17-18: “A significant percentage of the organic particles, up to 28 %, were composed of internally mixed with salts”. Something seems missing before “with” or “internally”. 2) Page 14422 - Lines 23-24: “For a spherical particle, the optical diameter is identical to the volume equivalent diameter”. I would guess this would significantly depend on the optical properties of the atmospheric particles with respect to those of the particles used for the calibration of the optical sizer (e.g. polystyrene latex spheres or Arizona dust) even for perfectly spherical particles. Therefore, the use of the term “identical” might be a bit too strong. - Line 24: “If we assume the particles are spherical”. I agree with the authors that using this approximation is probably the best one can do, but if the authors have any evidence of the quasi-sphericity of the particles, it might be good to mention it here; if the contrary it true, as it seems to be the case from other parts of the manuscript, maybe the authors should be more candid about the “roughness” of this assumption. 3) Page 14424 Line 14: “. . .irregular shape and density

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of agricultural dust” see the previous comments; this for example provides some evidence that particle sphericity is only a rough approximation. Lines 21-22: “Nd:YVO4 diode pumped solid state laser was used for excitation at 532 nm.” Is there a reason for using a green laser? Using a red laser could have reduced fluorescence interferences. A sentence explaining why the 532nm wavelength was chosen (maybe it was the only available, and that’s fine), might help. 4) Page 14428 Line 16: change “. . .we summed up the all particles. . .” to “. . .we summed up all the particles. . .” 5) Page 14433 Lines 4-5: change “. . .Six spectra could not be classified to due high fluorescence signal. . .” to “. . .Six spectra could not be classified due to high fluorescence signal. . .” 6) Page 14437 Lines 21-25: “While on-site levels of PM10 were extremely high, a large fraction of the coarse particles was rapidly deposited, and thus the impacts of the coarse mode were lessened at the regional level. However, the significance of the fine and coarse modes emitted from cattle feeding operations should be included for accurate assessments at the regional scale.” These sentences seem a repetition of what just said a few lines earlier at the beginning of the page, consider removing the repetitions. 7) Figure 3: The very last point in panel 3 for the urban PAS data (grey full circles) seems oddly low, maybe check this more carefully. 8) Figure 4: What is the meaning of the bottom part of the bottom panel is not immediately clear. 9) In general consider revising the use of acronyms; often acronyms are defined and then used only here and there and not used in other parts of the manuscript; a consistency check might help.

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