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

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''Comprehensive airborne characterization of aerosol from a major bovine source" by Sorooshian et al. is a very interesting study, and we would like to compliment the authors on their achievements.

The paper presents a comprehensive set of aircraft measurements, including quantitative data on aerosol particle hygroscopicity and cloud condensation nucleus (CCN) activity. With regard to the collection and presentation of CCN data, however, we would like to ask for clarification of the measurement procedures and results along the following lines.

Water vapor supersaturation is the primary variable inducing and determining the CCN

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activation of aerosol particles in the atmosphere as well as in CCN field measurements and laboratory experiments. With regard to measuring CCN at certain water vapor supersaturations, Rose et al. (2008) have recently demonstrated that:

(a) The effective water vapor supersaturation in a continuous-flow CCN counter (DMT-CCNC) as applied in this study depends strongly on the operating conditions (pressure, temperature, flow rate) and needs to be carefully calibrated with reference aerosols and Köhler model calculations. (This point was clear before Rose et al. 2008, but it seems to be frequently overlooked and may not be known to all scientists interested in CCN data.)

(b) The applicability of flow models for calculating the water vapor supersaturation in such instruments also depends on experimental calibration (non-ideal temperature offset, etc.), and the model results can deviate substantially from measurement results, especially at low supersaturation (up to 40% and more).

(c) The water vapor supersaturation values inferred by Köhler model calculations depend strongly on the type of Köhler model and on the water activity parameterization and other parameters applied in these calculations. Specifically, the critical water vapor supersaturation values calculated for ammonium sulfate particles, which are usually used for reference and calibration, can deviate by up to 20% or more from the most accurate models available.

Therefore, the CCN measurement results presented in Sorooshian et al. (2008, Tab. 3, Figs. 16 and 17) depend strongly on the operating conditions and calibration of the CCN counter. Presumably, the normalized data presented in Fig. 17 depend also on the Köhler model used for the reference substance ammonium sulfate.

The manuscript, however, provides practically no information about these aspects. It is not clear how the pressure, temperature and flow rate were adjusted and kept constant during the flights, and no uncertainty estimates are given for the nominal supersaturation values. Without such information it is hard to appreciate the reliability of the

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presented results and to compare them with other data (e.g., with regard to the influence of flow rate on CCN activation and droplet growth kinetics).

Thus, we suggest to include more information about the determination, regulation, and uncertainty of water vapor supersaturation in the applied CCN counter and to specify which Köhler models have been applied. From the manuscript we understand that the authors intend to prepare and publish a more detailed paper on the CCN measurements. Nevertheless, we think that a minimum of technical information and/or uncertainty indicators should be supplied whenever new data are presented and discussed.

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Reference:

Rose, D., Gunthe, S. S., Mikhailov, E., Frank, G. P., Dusek, U., Andreae, M. O., and Pöschl, U.: Calibration and measurement uncertainties of a continuous-flow cloud condensation nuclei counter (DMT-CCNC): CCN activation of ammonium sulfate and sodium chloride aerosol particles in theory and experiment, Atmos. Chem. Phys., 8, 1153-1179, 2008.

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