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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Laboratory and modeling studies on the effects of water and soot emissions and ambient conditions on the formation of contrail ice particles in the jet regime" *by* H.-W. Wong et al.

Anonymous Referee #2

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The discussion paper by Wong et al. reports results from a laboratory study on the effects influencing contrail formation. The authors used the Particle Aerosol Laboratory (PAL) altitude simulation chamber at NASA Glenn for studying contrail formation under different conditions with respect to water vapour emission, soot particle emission, and ambient conditions. The experimental observations are compared to results from a microphysical model.

The paper contributes to ongoing research on the impact of aviation on global climate. The approach of deploying a simulation chamber for controlled studies on the

processes involved in contrail formation deserves support. However, the paper is not acceptable in its current version for the reasons explained in the following.

1. The major weakness of the manuscript is the incomplete description of the experiment. In particular, the description of the PAL facility requires more detail, since the reference paper by Tacina and Heath is not accessible in the open literature. Without key information on the details of the PAL facility and on the way the experiments were conducted, the reader cannot assess the reported results. Information on the time series of pressure, temperature and relative humidity with respect to ice and water is crucially required, since these are the properties governing ice particle formation. Furthermore, a more detailed description of the extinction instrument and of the OPC is required because these are key instruments of this study.

2. The presentation of the experimental results is incomplete. In particular, size distributions of soot as measured with EEPS and of ice crystals measured with the OPC would help to classify the observations. Presenting ice crystal data and soot particle data only as number concentrations is not sufficient. The model predicts ice crystal size distributions but the authors do not show an intercomparison of predicted and measured size distributions but present model-experiment intercomparisons only for the mean particle diameter without specifying how this mean particle diameter was obtained. Here more details on observational data and on model results are needed.

3. The observations and the results from the model study disagree significantly. However, the authors do not discuss potential reasons for this disagreement and the resulting consequences for the data interpretation. Also, the uncertainty of observational data is not given so that the reader cannot judge if observation and model disagree statistically significant or if they agree within measurement uncertainty. An evaluation of measurement uncertainties is strongly recommended.

4. Concerning the interpretation of data and the conclusions section the authors are requested to carefully considering the short comment by D.J. Cziczo (ACP 11, C10635–

C10636, 2011).

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 26791, 2011.