Atmos. Chem. Phys. Discuss., 11, C15342–C15344, 2012
www.atmos-chem-phys-discuss.net/11/C15342/2012/

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.

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Received and published: 14 February 2012

We thank the referee for providing insightful and constructive comments in improving our manuscript. We have listed our responses to the comments and how the manuscript is accordingly revised point by point below.

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.

Response: We apologize for the erroneous citation for the paper by Tacina and Heath (2010). It is actually in the open literature as part of the conference proceedings from American Society of Mechanical Engineers (ASME) that can be purchased from ASME. We have corrected the citation and included the ISBN in the citation. We have also added the temperature and water vapor partial pressure values at the sampling locations derived from our tracer measurements in Figure 2 of the revised manuscript. Description of how we derived these values is added in Section 2.3 of the revised manuscript. Finally, we have added descriptions of the OPCs and the spectrometer used in the extinction measurements in Section 2.2 of revised manuscript.

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.

Response: We have performed new data analysis and model calculations regarding ice particle size and number concentration. We now compare the modeling results with the extinction data, which contain both particle number and size information. The OPC results, which obtained from two size channels (0.3–1.0 micron and 1.0–3.0 micron as described in the revised manuscript), are now used primarily as ice particle number

concentration information.

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.

Response: We have performed new data analysis and model calculations and reworded the text in the revised manuscript to better describe comparisons between the modeling results and the experimental data. Reasons of why modeling results and experimental data disagree are added in the revised manuscript.

4) Concerning the interpretation of data and the conclusions section the authors are requested to carefully considering the short comment by D.J. Cziczo.

Response: We have revised the manuscript based on the comments provided by Prof. Cziczo. The responses to Prof. Cziczo's comments are posted on the open discussion forum.

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