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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "On the relationship between Arctic ice clouds and polluted air masses over the north slope of Alaska in April 2008" *by* C. Jouan et al.

**Anonymous Referee #1**

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The authors hypothesize that SO2 emissions could reduce the ice nucleation properties through acidification, which would result in smaller large ice crystal concentrations and enhance precipitation. For this air mass trajectories have been computed and cloud types TIC-2B and TIC-1/2A have been tried to characterize.

Although this kind of Arctic study is important, the quality of the presented and discussed results is poor and the paper needs major revisions.

1. The authors should clearly explain, what are their new results worthwhile for publishing compared to other cited studies, e. g. Jouan et a. (2012).

2. The paper needs a stronger science focus, is too long and difficult to read. Especially



chapter 5 needs a clearer focus with respect to the key topic of the manuscript.

3. The presented results are not convincing enough to confirm the hypothesis. Only 2 flight segments and one layer of cloud data is selected to highlight the above mentioned hypothesis. Therefore much more in-situ data are required.

4. The difference in the 2 selected data sets TIC-2B and TIC-1/2A is relatively small and therefore not really convincing to underline the hypothesis.

5. The authors argue with indirect arguments using satellite data, but a combined analysis of the in-situ data showing the aerosol acidicity would be more convincing.

6. There is a clear need for confirming the established hypothesis in a chemical transport model or regional climate model with interactive chemistry. Simple trajectory calculations are not enough.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 4331, 2013.