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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Numerical simulation of flow, H_2SO_4 cycle and new particle formation in the CERN CLOUD chamber" *by* J. Voigtländer et al.

Anonymous Referee #2

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This paper investigates the mixing of gases and their reaction products, including newly-formed aerosol particle, in an experimental chamber. Although quite technical, the paper can be considered important for designing, understanding and interpreting the experiments conducted in this paper. The paper can be accepted for publication after the authors have addressed the following comments:

Title: I am not fully satisfied with the title of this paper. The whole idea of the paper is to simulate the influence of mixing conditions in the chamber, yet mixing is not mentioned in the title at all. Saying that the paper simulates new particle formation gives also a wrong impression about the contents of the paper: in this regard, the paper investigates whether mixing conditions might significantly affect new particle formation in the chamber.

Introduction: Firstly, in motivating the word, more recent references on the cosmic ray-cloud connections should be included. Secondly, as far as I know, the CLOUD chamber is very useful not only in investigating the influence of cosmic rays, but also because it is a very clean experimental facility for aerosol formation studies. This could be mentioned here.

Section 3.1: I do not understand what the authors mean by the numerical grid in figure 2 (also figure 5) please explain somewhere in the text.

Section 4.1.1: Gaseous sulfuric acid concentration measurements are known to have a relatively large uncertainty. Does this uncertainly play any role in comparing simulations with sulphuric acid measurements, and could it affect the conclusions made in this paper?

Section 4.1.2: I do not think it is necessary to use a whole paragraph for discussing sulphuric acid diffusion coefficient.

Other issues:

The authors find a strong influence of the shape of the fan/fans on their simulation results, yet they cannot say which fan shape they should apply in their simulations. Is the sensitivity of the obtained result to the fan shape a real thing, or does emerge from numerical treatment of the problem?

In my opinion, there are too many figures in the paper. Some of the figure could perhaps be combined together (i.e. figures 8-11 could as well be figure 8a to d) or, alternatively, some figures might not be necessary at all.

The figures plotting curves should preferably be made to look more alike. Now there are at least 2 or 3 different figure formats for such figures.

There are a few grammatical mistakes throughout the text. The authors should check out the language carefully when preparing the final version of the paper.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 20013, 2011.