Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-536-RC1, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The role of ions in new-particle formation in the CLOUD chamber" *by* Robert Wagner et al.

Anonymous Referee #1

Received and published: 3 August 2017

Ion-induced nucleation has been widely accepted as an important source of new-particle formation, as well as a famous argument for its ratio in atmosphere. This manuscript aims to reveal the ion role via a well-designed experiment at the CERN CLOUD chamber with novel characteristic instruments. This study presents very important experimental data to support the enhancement of ions in the nucleation process. The first time the ion contribution has been examined in such detail. In general, this manuscript was well-organized and the main conclusions will help improve the current understanding of new-particle formation. This manuscript should be published in ACP. I suggest a little more discussion and analysis to clarify the details behind the presented results. Specific comments:

1. Page 9, line 30: "...a linear decay." If the charged fraction was a linear decay in the

Printer-friendly version

Discussion paper

averaged experimental data, the author possibly could further estimate the charged fraction in a lower diameter, such as < 0.5 nm, which can reveal the role of ions in the initial stage of nucleation.

2. Page 10, line 7-10: the authors should give more detail discussion to explain the decrease of charged fraction of nucleation rate at higher temperature (figure 3 a).

3. Page 10, line 10-12: since the ion-ion recombination increases at a larger size (such as 2.2 nm), the authors possibly can make estimation to get the ion-induced fraction at the initial nucleation stage at a molecular level. The ion contribution of nucleation at molecular level will be toward the final answer for the role of ion-induced nucleation.

4. Page 10, line 21-25: the author should give more detail description on the characteristics and roles of NOx in the nucleation process to distinguish the system II and III.

5. Page 10 line 29 – page 11 line 8, last paragraph: ammonia was added in the system IV to reproduce an environmental simulation. Since the ammonia ion is easier to carry positive charges, its role in the nucleation was described as a help to stabilize the sulfuric acid. I think the authors possibly could present a more detail explanation as the ion-ion recombination.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-536, 2017.

Printer-friendly version

Discussion paper