

Interactive comment on “Results from the CERN pilot CLOUD experiment” by J. Duplissy et al.

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Review of “Results from the CERN pilot CLOUD experiment” by Duplissy et al.

This paper describes the experimental setup of the pilot CLOUD experiment at the CERN Proton Synchrotron and discusses some of the results from the pilot experiment. These pilot experiments explored the influence of cosmic rays on new-particle formation. In some experiments there clearly is evidence that ionization from cosmic rays increase new-particle formation rates; however, a major finding of this paper is the sensitivity of new-particle formation rates to undesirable inputs, such as out-gassing of chamber walls, which made it difficult to isolate the factors affecting nucleation. Thus, this pilot experiment provided very important information for improving the design of the CLOUD experiment.

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This paper highlights the initial results from a very important experiment, the paper is well written and is within the scope of ACP. I highly recommend this paper to be published in ACPD. I have a few comments that I would like addressed.

General comments

1. It would be great if there was a section at the end dedicated to describing the next CLOUD experimental setup and how it would differ from the one described here. There is some discussion of this throughout the paper, but it would be good if it was organized in one place.
2. The overall goal of the CLOUD experiment is to better understand the effect of cosmic rays not only on aerosols, but on cloud droplets and ice particles too. In doing this, the aerosols must grow to CCN sizes under near-atmospheric conditions. This means that the newly formed particles must grow for hours to several days in the presence of pre-existing particles.

On these time-scales in an 8 m³ chamber, the wall loss of particles will be large and very important. The wall-loss rate is a function of particle size and depends on the particle charge and electric fields in the chamber. This means that the size-dependent wall-loss rate may change greatly depending on the strength of the beam intensity. In general, this size-dependent wall-loss rate is very difficult to quantify, though most of my experience is with teflon-walled chambers rather than stainless steel.

I would guess that properly correcting for these wall-loss processes will be as important as understanding the sensitive nucleation behavior during full CLOUD experiments with particle growth to CCN sizes. I understand that the particles in these pilot experiments were generally smaller than 20 nm, but was any estimate of the particle wall-loss rates done? experiment to experiment variability of wall-loss rates? effect of the beam intensity on wall-loss rates?

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Specific comments

1. Page 18244, Line 13: "I = 61", what is I?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 18235, 2009.

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