

Interactive comment on “How quickly do cloud droplets form on atmospheric particles?” by C. R. Ruehl et al.

Anonymous Referee #2

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Review of Ruehl, Chuang and Nenes,

This is an excellent paper describing the first deployments of a technique to assess the growth rates of aerosols as they are activated to micron-sized water droplets. The CCN community has traditionally used the Kohler model for activation, which is entirely thermodynamically based. Kinetic effects in droplet activation have been hinted at in some past studies, but this is the first focused attempt to assess these effects in the field. It is found that there are frequent occurrences where droplet growth is kinetically hindered and a few examples where the growth is faster than with ammonium sulfate. These are new results that open a door to subsequent studies of these kinetic effects that could be quite important in the sequence of aerosol activation at cloud base. The paper should be published. I have a few recommendations below.

1. A few more experimental details should be given on the droplet sizing technique. How is the sizing accuracy determined? How is the technique calibrated? Are there additional references that could be made to development of this instrument? (Page 14240)

2. The measurement of a mass accommodation coefficient of roughly 0.01 for the activation of ammonium sulfate stands in contrast to the latest experiments that are converging on a large value for the mass accommodation of gas-phase water on liquid water droplets of larger than roughly 0.1, i.e. larger than the value that would be rate-limiting for water uptake to micron-sized droplets at atmospheric pressure. And so, a value of 0.01 is an important result in its own right but there is little discussion of it in the paper. Do the authors believe that their value is a robust measure of the mass accommodation coefficient of water on water, i.e. of comparable validity as those measured by recent experiments done, for example, by Aerodyne/Boston College and by Wagner (Vienna)? If so, then there needs to be additional discussion of the systematic uncertainties that might arise in determining it. If not, then I recommend that the term 'mass accommodation coefficient' (or even 'apparent mass accommodation coefficient') not be used because it will lend confusion to this specific field. i.e. it is better for this term only to be used when experiments are designed to specifically measure this quantity. (Page 14243).

3. Small point. I recommend switching the numbers that are listed as '10-to-the-power-of-x'; to standard scientific notation. (Throughout the paper).

4. Small point. Others to measure the effect of small amounts of soluble material in an internally mixed particle are Raymond and Pandis, 2003, and Broekhuizen et al., 2004. (Page 14243).

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 14233, 2007.

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