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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Detecting charging state of ultra-fine particles: instrumental development and ambient measurements" *by* L. Laakso et al.

Anonymous Referee #1

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This paper is a really interesting piece of work - a creative instrumental setup, the 'Ion-DMPS', to determine the relative importance of ion-induced nucleation compared with neutral nucleation.

The paper is mostly very clear and well-written and the results are definitely of high interest. At this point, however, the core results are based on theory that is not well-enough explained and justified.

If the theory is better explained and justified (and is correct), the paper becomes excellent - if not, I don't see how it could be of much use.

MAJOR COMMENT:

1. The main conclusions of the paper are based on the use of equation 1 (on page

6410), which is an approximation based on four important approximations, listed before the equation.

First of all, the text is now written in such a way that it should be straightforward to 'see' how the equation comes about. This is however not the case.

Second, all of the listed assumptions can be either wrong or at least somewhat approximative.

Thus, in my view, it is desirable that the derivation of equation 1 is shown in detail (repetition of the 'Kerminen and Kulmala de rivation, as the authors state it...), starting from an exact equation and showing in detail where each of the four assumptions come into play and how. In addition, some estimation of the effect of these assumptions on the results presented is needed. If this is not achievable in a 'simple way', then, based on the authors' previous work, they posess a detailed modeling framework, by which such estimations could be easily done.

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