

***Interactive comment on* “Nucleation mode growth rates in Hyytiälä during 2003–2009: variation with particle size, season, data analysis method and ambient conditions” by T. Yli-Juuti et al.**

Anonymous Referee #1

Received and published: 31 August 2011

Based on a large data set spanning measurements at a Boreal site from 2003 to 2009, this paper describes calculations of nano-particle growth rates following new particle formation events. Growth rates of these newly formed particles have been investigated for some time now and this paper adds important new insights and should be published.

I have only one major suggestion. A more detailed and comprehensive discussion summarizing growth rates from previous studies would be beneficial and help put this work in perspective. Interspersed throughout this paper are brief comparisons to other papers, but it seems to be rather haphazard. A table summarizing previous work may be an effective way to summarize previous studies and provide more clarity. For example,

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at the top of pg 21270, a brief discussion is given on particle growth rate measurement methods from previous studies, but no GR data are provided. Why not include the GR reported from these other studies? Also, it is stated a number of times in the Introduction that other researchers have never investigated GR uncertainties or compared methods. A clear and more comprehensive comparison of reported growth rates (eg, a Table) would give some idea if there really were large variability (eg, uncertainty?) in GRs reported in past studies, relative to what is presented here.

The authors do a nice job of discussion factors related to growth rates for various nano-particle size ranges. Some viable explanations are provided for larger size particle growth rates, but the constant growth rates for the smallest detected particles remains somewhat mysterious. It appears to me that not only are these growth rates constant at this site, but they seem to be similar (or more similar compared to larger particle growth rates) when compared between different sites. (My impression is that the smallest particle growth rates tend to be in a similar range of 2-5 nm/hr in a wide range of measurement locations). In any case comparing variability for various sizes between sites (eg, as in a Table discussed above) could be of interest.

Specific Comments:

Pg 21271 line 3 is not clear. Are you saying: . . . However, observations suggest that its contribution to particle growth following the NPF is typically of the order of a few percent of the observed growth rate.

Pg 21276 line 6, does the parameterizations apply for the whole year, or just in summer? It is also not clear how O₃ was measured and for what duration O₃ data was available?

Pg 21279 Line 9, isn't a first order polynomial a line, why not just say it was fit with a line (eg, presumably standard linear regression).

Pg 21292 Line 13, the observation that NPF and growth are decoupled from a common

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condensing vapor was noted long before the Kulmala et al. 2004 paper (Weber et al, JGR 1997). In fact, much of the fundamental observations on which this paper are based, decoupling of NDF and GR and GR exceeding that of only sulfuric acid, were first reported almost 15 years ago by other researchers. The authors should consider putting this work in a broader perspective and try to include more references beyond their own work.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 21267, 2011.

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