

## ***Interactive comment on “Using measurements of the aerosol charging state in determination of the particle growth rate and the proportion of ion-induced nucleation” by J. Leppä et al.***

**Anonymous Referee #2**

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General comments:

This study presents a comprehensive, detailed inter-comparison of published methods for obtaining aerosol dynamic properties (growth rate, charge fraction, relative contribution of ion-induced nucleation) from measured size distributions of total and charged aerosol. The accuracy of those methods was determined by comparison with the output of an aerosol microphysical model under diverse, representative simulation conditions, yielding ranges of applicability for each method. The results of this study provide reasonable guidance for the application of these methods when studying ambient measurements. I recommend publication of this manuscript with minor corrections

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listed below.

Specific comments:

1. p. 21869, l. 15: The “certain conditions” that are mentioned here almost exclusively refer to laboratory experiments in which charged particles/ions are detected with a higher efficiency than their neutral counterparts. For the sake of clarity, consider stating explicitly that this charge preference for particle activation has been observed in laboratory experiments.
2. p. 21881, l. 17 – 20: It is not clear how the diameter dependence of the growth rate is accounted for since any size-dependence to the growth rate is lost when averaging over the size intervals in DR1 and DR2.
3. p. 21897, l. 11 – 12: How is possible to have the ratio of the initial charged fraction to the fraction of IIN be greater than 1?

Technical corrections:

1. p. 21869, l. 12: Consider replacing “big” with “large”, when indicating relative size here, and in subsequent instances.
2. p. 21869, l. 13: Amend to read “By activation, we mean a process by which the ion reaches a size...”
3. p. 21869, l. 23: Amend to read “is important from a climate change...”
4. p. 21870, l. 1: Amend to read “particles are at a balance...”
5. p. 21871, l. 8: Amend to read “...we aim to address the effect of the following conditions on the precision...”
6. p. 21872, l. 8: Amend to read “...in a case of a non-growing...”
7. p. 21872, l. 17: Amend to read “... as the ratio of the fraction...”
8. p. 21877, l. 15: Amend to read “instrumentation”

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9. p. 21877, l. 17 – 18: Amend to read "...rates higher than the largest value...have been observed..."
10. p. 21882, l. 14: Amend to read "fraction at 1.8 nm in diameter."
11. p. 21885, l. 17: Amend to read "...and due to the fact that..."
12. p. 21893, l. 14: Consider replacing "things" with "aspects"
13. p. 21893, l. 15: Amend to read "...has to be sufficiently high, preferably at least..."
14. p. 21897, l. 23: Amend to read "...a value indicative of charge equilibrium..."
15. p. 21914, Table 5 caption: The units of the new particle formation rate should be  $1 \text{ cm}^{-3} \text{ s}^{-1}$ .
16. p. 21922, Figure 8 caption: For the sake of clarity, amend to read "...initial charged fractions on the y-axis (A and B) are determined..."

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 21867, 2012.