

## ***Interactive comment on “Parameterization of ion-induced nucleation rates based on ambient observations” by T. Nieminen et al.***

**Anonymous Referee #1**

Received and published: 20 October 2010

### **General comments**

The manuscript describes the formulation of a semi-empirical parameterization of ion-induced nucleation based on AIS and CIMS measurements during the EUCAARI project. An alternative parameterization based on global radiation intensity is also described. This is an interesting paper that fills a niche in our understanding of ion-induced nucleation. While it does not discuss the proportion of charged 2-nm particles which form around ions or which are charged after having already nucleated, the parameterization is well-suited to its stated purpose of use in a large-scale atmospheric model. When minor comments outlined below have been addressed, the manuscript should be considered for publication.

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### **Specific comments**

“However, none of these parameterizations have been tested properly against atmospheric measurements due to the general lack of suitable field data for this purpose.”

Have the authors considered comparing the results of their parameterization with the others which they have mentioned, for typical atmospheric values of secondary organic aerosol? If so, do they find any notable similarities or differences?

“The measurements in...were performed with the CIMS operated by the Deutscher Wetterdienst DWD...whereas in Hyytiala the CIMS of the University of Helsinki was used.”

How were the CIMS calibrated? Were the H<sub>2</sub>SO<sub>4</sub> readings equivalent between the sites, and if not, within what range of uncertainty did they differ? Do the authors expect this to have an effect on the parameterization?

Were data from any of the other EUCAARI sites used to test the validity of the parameterization after it had been formulated? I understand that information on [H<sub>2</sub>SO<sub>4</sub>] or [Org] may not have been available for every location, and do not expect the authors to include this test within the paper; however, I am curious as to whether these tests have been or will be conducted.

### **Technical corrections**

Section 2.1: “...the AIS consist of...” to “...the AIS consists of...”

Section 2.1: BSMA mobility diameter range of 0.8-8.0 nm differs from that in the legend of Fig. 1 (0.8-7 nm).

Section 2.2: Please define “high enough” concentrations of ions.

Section 2.2: commas in list: ...coagulation, scavenging, and growth of particles...

Section 2.2: “...of charged 2-nm charged particles...” to “...of 2-nm charged particles...”

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Section 2.2: < missing from subscripts in Formula (1).

Section 2.2: "... $\beta$ , are be assumed..." to "... $\beta$ , are assumed..."

Section 3.2: We considered **the** following...

Section 3.2: As in **the** case...

Section 3.2: ...constrained to values **of** 1 or 2.

Section 3.2: "...for all the 12 EUCAARI..." to "...for all 12 EUCAARI...'

Section 3.2: "...for the data sets obtained on the four stations..." to "...for the data sets obtained at the four stations..."

Section 3.2: "...from where sulphuric acid data..." to "...from which sulphuric acid data"

Section 3.2: "As during these times also the global radiation is highest..." to "As global radiation is also highest at these times..."

Section 3.2: "...the strong dependence of particularly organic vapor concentrations on other factors than solar radiation," to "...the strong dependence of organic vapor concentrations in particular on factors other than solar radiation."

Section 3.3: Very few atmospheric models trace **the** cluster ion concentrations...

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 21697, 2010.