

## ***Interactive comment on* “Characterisation of corona-generated ions used in a Neutral cluster and Air Ion Spectrometer (NAIS)” by H. E. Manninen et al.**

### **Anonymous Referee #1**

Received and published: 29 May 2011

#### General comments:

The presented paper by Manninen et al. “Characterisation of corona charger ions used in Neutral cluster and Air Ion Spectrometer” clearly addresses up to date scientific relevant questions and describes the problematic of the measurements of atmospheric sub 5nm particles and clusters. The used methodology is state-of-the-art and describes the size limitations of the application of the NAIS instrument. Manninen et al. thoroughly describe the “dilemma” of the filtering of charger generated ions without removing the sample particles at the same time. Especially for the NAIS instrument, this is of high significance, as it is one of the few instruments that are able to detect atmospheric,

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and therefore low concentrated, neutral molecular clusters and nano-particles. Their main experimental work is partly novel: an attempt of the physical and chemical characterization of ions generated by an aerosol charged based on corona discharge. The manuscript also describes the basic principles of operation of the NAIS, clearly helping to understand the topic for readers with minor DMA background. The experiments are sufficiently described and were performed according to the up to date scientific methods. The language is fluent and the overall presentation is well structured with only some sections that are in need of improvement (see specific comments).

Specific comments:

From my point of view, the only major improvement that has to be carried out is a revision of the reference list: At the moment, numerous references that are mentioned in the manuscript are missing.

My other comments are related to the measurement of the ionic molecules:

\*) On page 2108, line 4 it says that the negative ions, presented in Fig. 5, are shifted towards smaller sizes with increasing relative humidity. I cannot see that from the graph in Fig. 5. and would also be contradictory to my experience in this field up to now. They are rather shifted to larger sizes, indicating an accumulation of water molecules on the clusters.

\*) Also on page 2108, in line 21 it is stated, that the red line in Fig. 6 represents ion spectra that were recorded during a humidification of the carrier gas. This is somehow confusing with the labels given in Fig. 6, as there it says that the red line represents measurements including a silica-gel dryer. Reading this I would assume rather dry conditions. It is absolutely necessary to clarify these points. Otherwise, the change of the properties of the ions by different operating conditions is obscured.

\*) on page 2109, line 14, it says that there may occur some fragmentation inside APi-TOF, but for this application (the measurement of charger generated ions), these effects

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are considered small. My simple question is: why? Of course, the API-TOF itself is not matter of discussion in this paper, but for example, there is no sign of water in the mass spectra shown in Fig. 7. The complete absence of water seems to me as a huge effect of fragmentation, especially as there were experiments carried out with a controlled humidification of the carrier gas. I would suggest addressing this topic in the manuscript as well.

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 2099, 2011.

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