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Atmospheric Measurement Techniques Discussions

Interactive comment on "Characterisation of the transfer of cluster ions through an Atmospheric Pressure interface Time-of-Flight mass spectrometer with hexapole ion guides" *by* Markus Leiminger et al.

Anonymous Referee #3

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This manuscript presents development of a similar instrument to the popular APi-TOF currently used in the measurements of atmospheric ions. The instrument uses two hexapoles instead of the traditional quadrupoles to guide the ions through the APi and shows some advances by using the hexapoles as the guides. Characterization of transmission efficiency, and ion transfer was presented. In addition, the mass windows between the IoniAPi-TOF and the APi-TOF were compared by concurrent measurements from the cloud chamber experiments. The manuscript is well organized and written, and certainly in the scope of the journal. However, some issues need to be

resolved before it can be publishable in the journal.

1. Why hexapoles not octapoles or higher order multipoles are employed in the instrument? What are the advantages by using the hexapoles as the ion guide compared to those high multipoles? There are also some literatures available in modeling ion trajectory for the multipoles. It will be of interest to the readers if the authors can add a brief literature overview in this aspect.

2. Figure 4 shows the overall transmission efficiency of the instrument. It would be beneficial to the readers if the authors provide detailed supplementary material information to illustrate the detailed process how to come up with the transmission efficiency curve since this is a very important part of the instrument calibration, e.g., what flow value was used, how to account for the fragmentation etc.

3. The distribution of the hydronium ion clusters with various voltage gradients between the skimmer and the second hexapoles shown in Fig. 7 is apparently dependent on many factors including the initial energy of the cluster (determined by the voltage applied in the entrance aperture), the voltage on the skimmer (currently grounded), the voltages on the lenses after the second hexapole. It is hence that the distribution may look differently under other settings. Did the authors tried any other settings? How those voltages may affect the distribution, especially how those voltages affect the detection sensitivity of the instrument?

4. In section 3.2.3, the authors assume that the binding energy is linear with the voltage gradient between the skimmer and the second hexapole, and estimate a threshold binding energy of about 8-10 kcal/mol for the hydronium ion clusters. The question is: how good is this assumption? It seems that the proposed binding energy is rather subjectable.

5. In Fig. 9, it is difficult to tell that the higher sensitivity from the ioniAPi-TOF in the higher mass range is real or just due to higher background noise since the signals are almost flat above 700 m/z for the instrument compared to the APi-TOF. In addition, the

comparison will be in a better view if the scale of the upper and bottom panels is set to the same physical height.

6. Some minor comments:

1) Some figures mentioned in the text were not in order. Please follow the correct order for the figure mention; 2) Consistency: for example, sometimes “at ground level” is used and “at ground levels”is used in other occasions; line 400, 406, 411 on p.13, First, Secondly, Thirdly. . ., please rephrase them to be consistent.

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