

## ***Interactive comment on “Development of an online-coupled MARGA upgrade for the two-hourly quantification of low-molecular weight organic acids in the gas and particle-phase” by Bastian Stieger et al.***

**Anonymous Referee #1**

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This paper discusses modifications to a MARGA for measurement of gas and particle organic acids, along with the traditional inorganic species. This type of data could be highly useful and so there is significant value in such an instrument. However, overall the paper is of marginal value. It is largely about setting up the ion chromatographic system to separate and measure all the various ions in a reasonable time. This information could have been presented in a technical report. Or alternatively, as there is apparently a paper focused on data analysis and interpretation from this study in progress, an option would have been to include the topics discussed in the coming

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paper supplemental section.

In any case, the authors background on methods is sparse and some new references are missing. For example, there are other IC approaches (capillary ICs) that can effectively measure these ions, see Nah et al, cited below. Possible artifacts with this method are not discussed, eg, is the denuder 100% efficient at only removing gases? A major shortcoming is that the ambient data, shown in support of the utility of the instrument, looks poor due to lack of data? Why is this? Did the instrument not work during those periods, or was the species to be measured below the LOD? This needs much more discussion. Example, if most of the species were below LOD for much of the time, why all the work to attempt to measure them with an online system? Can one expect to be able to measure them with this instrument at other locations? That is, does this data really demonstrate the value of this instrument, eg, pg 24 line 11 in Conclusion it states: The results of the example application proved the suitability of the MARGA extension for field measurements. In my view the lack of measurement of most species proves it did not perform well – an instrument that runs but provides little data is likely not of much value. These issues must be addressed prior to publication. Maybe there is another explanation for the lack of ambient data?

Specific Comments.

Introduction: No discussion of recent organic acid aerosol paper, which is directly pertinent. (Nah, T., H. Guo, A. P. Sullivan, Y. Chen, D. J. Tanner, A. Nenes, A. Russell, N. L. Ng, L. G. Huey, and R. J. Weber (2018), Characterization of Aerosol Composition, Aerosol Acidity and Water-soluble Organic Acids at an Agriculture-intensive Rural Southeastern U.S. Site, *Atm. Chem. Phys.*, 18, 11471-11491.)

Pg 2 line 28 and on. CIMS is criticized due to cost, too much data (is that really a problem?) and need for skilled operator. One could argue the same for the MARGA system proposed here. Give numbers for comparison. The MARGA system also likely has the disadvantage that it needs constant attention, unlike a CIMS. This should be

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clarified.

Methods: For cases, such as the measurement of organic acids with the described instrument, where a single detection method is used that cannot distinguish between gas or particle phases of a species and the species exists mainly in one phase, less than perfect gas/particle separation can lead to large measurement errors. For example, in this arrangement with the measurements done in series, gas then particle, say most of species X was in the particle phase (i.e., particle » gas), even a very small percent absorption of particles in the denuder will result in large bias in the gas phase measurement. In the other case, particle « gas, less than 100% gas collection will lead to a large bias in particle measurements, if the particle collection system will also collect the gas, which is likely in this system. For the study of organic acids, this is a large issue, which should be discussed in detail, that is report the denuder gas collection efficiency with uncertainty, and the penetration of particles through the denuder.

Results: What is the cause for all the missing data in Fig 8, data below LOD? Is so this should be discussed. Ie, give report fraction of data above LOD for all species in the ambient study.

Page 22, Fig 9. Maybe the diurnal profile was not due to photochemical formation, but instead temperature?

Pg 23, line 19-20. If most of the data is below LOD, how can the authors claim the instrument was a success?

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