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Atmospheric Measurement Techniques Discussions

Interactive comment on "Improved chloride quantification in quadrupole aerosol chemical speciation monitors (Q-ACSMs)" *by* Anna K. Tobler et al.

Anonymous Referee #3

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This manuscript describes the presence of a negative chloride signal measured in the widely used aerosol chemical speciation monitor (ACSM) instrument. This is an issue that has been observed in several instruments and up to now has not been formally addressed. In this work, the authors present long term observations of this artefact and perform additional detailed tests on instrument performance. The authors illustrated than this negative signal is essentially an artefact (stating that no other information regarding the source of Cl can be extracted), and propose a simple correction to the standard fragmentation table to account for it. Given the widespread use of the ACSM, this type of work is essential to providing homogenous measurements among all operating instruments.

This manuscript is well written with clear and concise text and well-presented figures. Although I recommend the manuscript for publication, I have some questions and comments below.

1) It is stated in the manuscript that there are a number of uncertainties related to how this artefact manifests itself in different instruments. The authors cite a personal communication whereby changing out the filament removes this artefact. Can the authors provide more information on this; does the artefact return after some time or is this artefact only present in instruments with an iridium filament?

2) Was this instrument newly installed at the start of sampling. Could the inversion of Cl be a result of the build-up of material (the total PM concentrations observed during the field campaign are very high)? The appearance of the negative m/z-35 was very sudden, did it correspond to any changes in meteorological conditions?

3)A slow decay and slow build-up (as well as an artefact that disappears when the filament was changed) would suggest that material is built up on the vaporizer and the surrounding area. Was the filament changed (in this instrument) after the experiment to investigate this? Do you have an approximate temperature range for your experiments (that correspond to the voltages used)? Were any improvements observed after heating the vaporizer to > 800 C over extended periods of time?

Line 110 (Figure 2): Is it possible to change the instrument settings so the sampling periods correspond to the end of the filter and sample run. This would better represent species that slowly build up and slowly decay?

4)Why is the Chloride (m/z 35) signal in the negative so much larger than in the positive? As is observed in the latter part of 2018 and early 2019.

At the very end of the sample period, it appears that the total reported Cl returned positive again, is this the case?.

5) During the 14 month sampling period what other instruments were sampling along-

side the ACSM, e.g. number and size distribution, filter measurements etc. Were any complementary measurements of refractory species made during this time.

6) How did the measured ACSM total mass compare with the total mass measured by the SMPS (if present) during these sample periods (excluding the negative chloride peaks periods)? Are there indicators of the presence of refractory species during this time.

7)Line 213: were any correlations observed between m/z 35 and Na+ (m/z 23) and or K+ (39)?, could these peaks also have interference with species other than NaCl+ and KCl+? When the correction is applied, is all the NH4 measured accounted for by that predicted from Cl-, NO3-, and SO42- (in the form of NH4Cl, NH4NO3, and (NH4)2SO4 respectively).

8) What recommendations should be given to data that is already submitted to data sets (e.g EBAS)?

9)Given the described behaviour of the 35 signal is there a general recommendation to apply this correction to all versions of the AMS instrument (AMS, ACSM, ToF ACSM etc)?

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