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Comment on amt-2021-228

Anonymous Referee #2

Referee comment on "A new method to quantify particulate sodium and potassium salts (nitrate, chloride, and sulfate) by thermal desorption aerosol mass spectrometry" by Yuya Kobayashi and Nobuyuki Takegawa, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-228-RC2, 2021

comments on "A new method to quantify particulate sodium and potassium salts (nitrate, chloride, and sulfate) by thermal desorption aerosol mass spectrometry "

This manuscript describes an analytical mass spectrometry-based method to measure refractory salts of sodium and potassium or atmospheric relevance. This work represents a useful advance for atmospheric measurements of these species, which are difficult or impossible to measure with current online instrumentation and often require slower, more labor-intensive offline analysis. The manuscript is well-written and straightforward, and I recommend it be published.

My main suggestion is that the authors include some context for the stated goals of measuring potassium in ambient biomass burning particles. What is biomass burning K+ associated with? Can it be associated with organic compounds, and if so, what are the prospects for detecting it? On a similar note, potassium is present in biological aerosol (Christopher Pöhlker Bärbel Sinha Manabu Shiraiwa et al., 2012). Should we expect that to be measured with similar efficiency to the compounds explored in this study?

Line 90-91. The authors should note that atomizing seawater does not produce sea spray aerosol that has the same composition of real sea spray aerosol produced by wave breaking-driven bubble bursting, e.g. (Fuentes et al., 2010). The differences may be mostly due to the presence of organics, but association of organics with some major ions may result in differences in the major ions in sea spray, which likely would not be replicated in atomized samples, e.g. see Salter et al. (2016).

Line 253. It is interesting that no NaCl cluster ions were observed. $ClNa_2^+$ is a singly charged ion that is observed in CIMS observations of thermally desorbed particles (Lawler et al., 2014). I think those observations show that NaCl can be desorbed as an intact molecule that can react with Na+ to form the cluster. I wonder whether it is more a consequence of the ionization scheme (EI) that no cluster molecules were observed. Can the authors comment on this possibility?

Table 3. It would be helpful to have the detection limits also reported in terms of total sample mass (ng).

Figure 2. Can the authors comment on the wide gap in desorption time between the NaCl peaks and the NaSO4 peaks? The bulk compounds differ in melting point by only about 80 K, while the difference in melting point of NaCl and NaNO3 is several hundred degrees and the peaks for these two compounds show up close in time. Is the rate of temperature increase of the graphite cup strongly nonlinear or is there some other explanation? If it is possible to estimate the temperature over the heating period, that would of course be helpful to show.

References:

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