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Atmospheric Measurement Techniques Discussions

Interactive comment on "A low activity ion source for measurement of atmospheric gases by CIMS" *by* Young Ro Lee et al.

Anonymous Referee #2

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Lee et al. tested a low activity radioactive ion source in a chemical ionization mass spectrometer. The manuscript is concise and written well. I only have minor comments (see below) which I am certain will be able to address before final publication.

General comments

(1) In several figures, the low activity source (1.5 mCi when new) was compared with the 'standard' source (20 mCi when new); however, these activities change over time due to the radioactive. In all figures, the age of the sources should be added.

(2) As far as I know, ion sources with activity of <10 mCi only require white (NON-RQ) shipping papers, which a 20 mCi reaches after ~5 months (https://nrdstaticcontrol.com/images/returns/SHIPP2000.pdf). Would using a half-year

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old 'standard' source be a viable alternative to the LAS described here?

Minor comments

line 9 - consider replacing "complications" with "regulatory burden"

line 11 - missing comma following (HCO2H)

line 18 - consider replacing "some field applications" with "short-term field deployments" or similar

line 60 - "49CFR 173.410; 49CRF 173.425, Table 4" What does this mean? Where is table 4?

line 75-113. Interference from peroxyacetic acid (and how it was minimized - see Phillips et al. Atmos. Chem. Phys., 13, 1129-1139, 10.5194/acp-13-1129-2013, 2013) should be mentioned.

line 82 -84. "PAN calibration standard" consider moving these 2 sentences to section 2.3.1 where the other calibration sources are described

line 100 - remove comma following et al.

line 112 - replace "detected" with "quantified"

line 119 - replace "as shown in Figure S2" with "and is shown in Figure S2"

line 121 - "effect from varying humidity". please state what is affected by RH (sensitivity?)

line 140 - "In general, the sensitivity of the LAS is approximately 2 to 4 times lower than that of the standard source, whereas the activity ratio is roughly 13" Are the values obtained with the LAS consistent with a standard source aged to an activity of 1.5 mCi? This is partially discussed later on but perhaps worth mentioning here.

line 149 - "may be preferable in some applications". Another example would be in polluted areas, where a LAS may be preferred also as the signals at m/z 59 may get

large (>10ˆ5)

line 137 - 151. "Performance of LAS". The results shown in Figures 3c and 3d are not talked about at all.

line 153. What ions were used to monitor formic acid, chlorine, and nitryl chloride? (should be stated here).

The sensitivities reported for chlorine and nitryl chloride are 2 orders of magnitude larger than reported by others (e.g., Mielke et al., 2011) who observed similar PAN sensitivity under conditions similar to panel (a).

line 165 "Figure S4" is called out before "Figure S3"

line 172 "less than the decay rate" Is this due to the generation of radioactive daughters?

line 174 "Figure S2" should be Figure S3.

Figure 3b - correct typo in axis caption (ion source fow)

Figure 3, caption. Please specify the ions monitored in the caption.

The difference between panels 3a and 3c isn't very clear. I suppose 3a was acquired at 2.7 slpm total flow and 3c at 6.5 slpm? Consider adding this information to textboxes to the figures (as was done in Figure 4).

Figure 4 - consider increasing the contrast between squares and circles as they're challenging to tell apart (e.g., replace solid with open circles).

Figure 4, caption. Please specify the ions monitored.

Figure S1c - 13C-PAN - is this m/z 61? Please clarify in the caption. "showing no obvious interference".

The signal is plotted on a logarithmic scale, so changes in intensity are difficult to spot to begin with. It appears to that there may some effect (factor of 2 perhaps) but it's

difficult to see. Please show these data on a linear scale.

To claim "no obvious interference" there would have to be some change in [NO] and [NO2]. Consider adding a scatter plot of the internal standard against [NO].

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