Atmos. Meas. Tech. Discuss., 8, C4560–C4562, 2015
www.atmos-meas-tech-discuss.net/8/C4560/2015/

Atmospheric Measurement Techniques Discussions

Interactive comment on "The airborne mass spectrometer AIMS – Part 2: Measurements of trace gases with stratospheric or tropospheric origin in the UTLS" *by* T. Jurkat et al.

Anonymous Referee #1

Received and published: 31 December 2015

The paper describes an airborne CIMS instrument for the measurement of SO2, HNO3, HCl, and HONO. Instrument characterization, calibration, and some initial measurements are described as well. A novel, discharge type ion source is described. The paper is quite long considering that the CIMS technique using SF5- ions has been around for a long time. maybe the authors could consider shortening the manuscript by eliminating some of the background discussion of ion chemistry and description of theoretical sensitivity as it does not apply anyway in the end.

I have no major concerns with the manuscript. There are a few qualitative statements that could be backed up better, such as:

p. 13587 / l. 25 what was the characteristic time scale of this exponential decrease?

p. 13591 / l. 16 - how is the expected HONO mixing ratio calculated? This should be difficult as nothing is known about the history of the air mass during convective transport, especially with respect to j-values and heterogeneous processes.

Another concern is the slow time response of the calibration. This is a problem for in flight measurements, as the characteristic time should be mostly independent of absolute mixing ratio, contrary to what is stated on page 13591 / line 16 and below. I think this issue deserves more insight, some of which could come from the comparison with the NOy instrument shown in Figure 7. Unfortunately the small plot shows three hours of data so the details of the relative time responses of the two instruments cannot be seen. The analysis of fine time scale data from the two measurements along with laboratory tests eliminating one or more of the inlet components should shed some light on this.

A 8-minute characteristic time for HNO3 is really not acceptable for aircraft measurements. These concerns should be addressed before the manuscript is published.

Technical comments and minor issues:

Abstract line 15 – what is meant by "a characteristic ionization scheme?"

Abstract l. 19 – write "low 10s of ppt range"

Abstract l. 22 – replace "expemplarily" with "for example"

Throughout manuscript – use "l" instead of "L" for units of liter

Page 13569 l. 13 replace "great" with "large"

13572 l. 15 and throughout rest of manuscript - replace "casted" with "cast"

13575 / 5 – was this technique employed here?

13576 / 5 – replace "in" with "of"

13576 / 10 – replace “analogically” with “in the same way”

13580 / 25 – how many measurements of the permeation rate were made during these 3 years? Just two? Is a linear decrease assumed?

13581 / section 4.2 – this paragraph describes issues with calibration and sensitivity but the statements are vague and general, the authors should be able to provide more precise results.

13585 / 18 – is that true for thunderstorm outflow (as shown in figure 5)

13587 / 25 what was the characteristic time scale of this exponential decrease?

13588 / 19 – I do not understand this. How does the effect of flushing the lines on the ground extend past the characteristic time scale of the system, e.g., 500s for HNO3??

13590 / 20 – figure 5 does not sow a flight pattern. Rephrase sentence “Results from a typical flight. . .”

13593 / 12 replace “stabely” with “stably”

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 13567, 2015.