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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaluation of ambient ammonia measurements from a research aircraft using a closed-path QC-TILDAS spectrometer operated with active continuous passivation" *by* Ilana B. Pollack et al.

Anonymous Referee #1

Received and published: 14 May 2019

This is a clearly written manuscript that documents the performance of a closed-path absorption spectrometer for the measurement of NH3 aboard an aircraft, with a particular emphasis on the utility of an active passivation technique. The manuscript is appropriate for AMT, and should be published after addressing the following issues:

General comments: In several places (e.g. P2, L29; P3, L32; P4, L27; P4, L33), the manuscript uses the term 'detector' to refer to the instrument itself, whereas in other places, including in Figure 1, 'detector' is used to refer to the MCT detector that collects the transmitted radiation, but is not in contact with the gas flow of the system.

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I found the more general use of the term somewhat distracting/confusing and would suggest using either ‘QC-TILDAS’, ‘spectrometer’, or ‘instrument’ in whichever case is appropriate.

In the section discussing the vibrational and structural issues, the authors mention (P5, L35) ‘reinforcing’ the ‘strain relief’. It was not clear to me if this involved providing more slack in the sampling lines, or making them more rigid. A little more information would be helpful. In Section 4.1, the authors describe a zero overflow experiment. Does the (> 500 sccm) refer to the difference between the flow of zero air being delivered and the flow pulled by the instrument? Clarification would be useful.

In Section 5.1, the authors explore the impact of inlet aging and the use of the passivant on the time response of the system. While the proportion of the time response governed by the slow, “adsorptive”, term was typically quite low (D < 10%), the magnitude of the step change in concentration was rather large (50 ppb), so caution should be taken in extrapolating that result to ambient observations.

Section 5.2.1 presents an interesting case study in which two intercepts of an intense NH3 plume led to much different sampling efficiencies depending on whether or not the passivant was being added to the inlet, as the result of a recent pre-flight contamination. I found this section a bit confusing because the time period between 13:20 and 13:23, when both the QC-TILDAS and the PTR-TOF-MS measured enhanced (and consistent) NH3 is not described. One infers that the passivant was being used at the time, however it’s not clear.

Specific comments:

P2, L11 – NH3 is regulated under the Gothenburg protocol in some parts of the world.

P3, L33 – The ‘D’ in QC-TILDAS has traditionally stood for ‘differential’, not ‘direct’

P7, L41 (and subsequently) ‘Hydroscopic’ should be ‘hygroscopic’

Figure 8 caption – ‘colorded’ should be ‘colored’

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