

Atmos. Meas. Tech. Discuss., referee comment RC1
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Review of Furlani et al

Anonymous Referee #1

Referee comment on "Validation of a new cavity ring-down spectrometer for measuring tropospheric gaseous hydrogen chloride" by Teles C. Furlani et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-105-RC1>, 2021

The manuscript entitled "Validation of a new cavity ring-down spectrometer for measuring tropospheric gaseous hydrogen chloride" by Furlani et al. discusses the implementation of a commercial spectroscopic HCl instrument for ambient air measurements. The study indicates that the Picarro HCl CRDS instrument can be implemented with low detection limits, high precision, high time resolution, and similar/better accuracy compared to a cadre of other trace HCl measurement techniques. Discussion of sampling and analytical issues is thorough and thoughtful. Statistical treatment and reporting is adequate. Studies of inlet effects is detailed and provides important information for potential users in the future.

This paper is high quality and should be published in *Atmospheric Measurement Techniques* pending consideration of a small number of comments provided below.

Line 229 and Figure 1: Please provide a reference (within the associated text) to the approach of using the Allan-Werle deviation.

Lines 246-248: "spectroscopic techniques offer a distinct advantage as they are absolute measurements and accuracy determinations rely on propagating uncertainty in measured parameters" This statement is then met with the reality of the present study [in subsequent lines of this paragraph] in which concurrent denuder measurements are used to determine accuracy. Why not stand upon the 'distinct advantage' that spectroscopic measurements provide? [See also: next comment.]

Lines 248-251: "In the absence of determining accuracy of the CRDS system from its operating parameters..." Is this due to lacking knowledge of these parameters due to the commercial nature of the instrument or are the intercomparison differences seen to be greater in importance, greater in magnitude, or both? Overall -- please clarify the

motivation for the accuracy determination approach that was undertaken.

Calibration questions: What is the impact of uncertainty in the permeation tube HCl concentration on the mixing ratio determination by the CRDS instrument? For instance, why aren't the error bars in the horizontal direction in Figure 2 comparable to those in the vertical direction? How can a measurement have lower uncertainty than the standard from which it was calibrated? Please clarify this issue. Perhaps I am confused about details of the study, but so too may be a future reader.

Figures 2 and onward: Numbering of figures in textual references is often (always?) incorrect.

Line 362: Please clarify whether the effect of sampling line flowrate on τ_1 was investigated experimentally or if this point is a supposition.

Line 363: Change to "An additional set of experiments was..."