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Atmospheric Measurement Techniques Discussions

Interactive comment on "Calibration of sealed HCl cells used for TCCON instrumental line shape monitoring" *by* F. Hase et al.

Anonymous Referee #2

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General Comments

This paper describes a new procedure for calibrating HCl cells that are used to determine and monitor the instrumental lineshape of FTIR spectrometers deployed in TCCON. The procedure involves the use of a C2H2 reference cell to accurately assess the purity of the HCl samples. The results can be used to improve the consistency of ILS parameters, and hence of CO2 and other trace gas retrievals, across the network. This study addresses an important issue, as the requirements for very high precision and accuracy on measurements of CO2 columns necessitates careful characterization of instruments to reduce biases within datasets and between sites. The manuscript is concise and well written, and the topic is relevant to TCCON and to the wider community using TCCON data for a variety of scientific applications. I recommend publication

in AMT after the following very minor revisions.

Specific Comments

Page 7187, Abstract – The abstract is rather brief. I suggest adding a few sentences that address the implications of the work and how the findings will be used. Define what is being calibrated.

Page 7192, last para – Briefly comment on the normalization that results in a modulation efficiency greater than 1.

Page 7195, lines 18-22 – Comment further on the behavior of the ME beyond 45 cm, and why the HCl and C2H2 results differ.

Page 7196 – A simple flowchart would be useful to illustrate the steps and inputs in the calibration procedure.

Page 7198, lines 21-28 – Clarify the discussion here regarding why "the observed bias reveals half of the actual bias".

Page 7207, Figure 2 – I suggest overlaying a line indicating the path of the beam, and add numbers to items that can be referenced in the caption, rather than repeatedly using "on the left" and "on the right", which is hard to match to the various components.

Technical Corrections

Page 7187, line 7 – change applies to employs

Page 7187, line 13 – "of the radiatively. . ."

Page 7188, line 10 – define ILS here, not at line 15

Page 7188, line 16 – delete applied

Page 7188, line 18 – change irradiated to irradiance

Page 7188, line 19 – here and throughout the manuscript, change wave number to

wavenumber

Page 7188, line 23 – “involves . . . model and spectral line lists, and includes”

Page 7188, line 24 – “such as the ILS” “data products of high precision and accuracy.”

Page 7189, line 9 – change applied to employed

Page 7189, line 15 – “Hase (2012)”

Page 7190, line 22 – change close-by to nearby

Page 7191, line 10 – change proportions to degrees (or levels)

Page 7191, line 17 – “determination of the”

Page 7191, line 20 – change connected to converted

Page 7192, line 8 – “an XCO2 result”

Page 7192, lines 17-19 – wavefront, wavelength, wavenumber

Page 7193, line 4 – change aspired to target

Page 7193, line 15 – “for the sake of clarity”

Page 7193, line 16 – change fictive to fictitious

Page 7194, line 2 – delete used

Page 7194, line 3 – subscript 2 in CaF2

Page 7195, line 17 – what does 2,. . .2.5% mean?

Page 7196, line 3 – “HCl cell to be tested”

Page 7196, line 15 – “and the standard deviation is about 0.3 K.” Standard deviation of what?

Page 7197, line 6 – implicitly

Page 7197, line 7 – line-broadening

Page 7199, line 9 – (Wunch et al., 2010)

Page 7201, line 9 – change “appended to” to “observed at”

Page 7201, line 16 – specify C2H2 or HCl reference cells here

Page 7202, line 12 – “method to investigate a”

Page 7202, line 16 – “characterization at regular intervals.”

Page 7205, line 1 of table – “origin, batch, and location”

Page 7208, Figures 3, 5, 9 – wavenumbers on x-axes and in Figure 3 caption

Page 7210, Figure 5 caption – “refers to the use of”

Page 7214, Figure 9 caption – Change appended to observed. Dashed lines are not really visible – could note that they are directly over the red and green lines, if true. State which cell – HCl or C2H2.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 7185, 2013.