Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2016-95-RC2, 2016

Atmospheric Measurement Techniques Discussions
Open Access
EGU

Interactive comment on "Inter-comparison of two cavity ring-down spectroscopy analyzers for atmospheric $^{13}CO_2$ / $^{12}CO_2$ measurement" *by* Jiaping Pang et al.

Anonymous Referee #2

Received and published: 15 June 2016

General comments:

Pang et al. describe laboratory tests to assess the performance and compatibility of two CRDS instruments. Sensitivities to H2O and CO2 concentrations of the reported d13C-CO2 are investigated after the typical performance other IRIS instruments are discussed in the introduction. Experiments are clearly described and analysed. All results are presented in a sound manner and the manuscript seems well structured. The scope of this study is well in line with the readership of AMT. The G1101i used is currently often replaced by G2201 or other instrumentation as they have often been in use for many years. Nevertheless, it can be an important contribution as, especially during such transitional phases, knowledge about the compatibility of different instru-

Printer-friendly version

Discussion paper

ments can be crucial. The conclusion section should to be more instructive, e.g. the authors find that the water correction works sufficiently well. However, it is never established – sufficiently well to do what? Unfortunately, the authors do not make wider recommendations for the IRIS user community based on their results or the need for future IRIS comparison studies. After addressing these minor issues (and the specific comments) this study seems suitable for publication in AMT.

Specific comments:

Line 113f – Including a graphic of the test setup would be most helpful/necessary here

Line 116f – Please add the information about the observed stability of the set points of 45C, 140Torr and 148Torr. Both for G1101i and G2201i instruments those parameters change within a small range and it would be beneficial for the reader to see if the variations could be a relevant sources of error.

Line 130 – Please clarify your use of the term “standard gases” here. I suggest using “reference gas” instead as the gas was not provided by a NMI or a central calibration laboratory, but a private company. I would strongly suggest to follow the nomenclature of WMO/GAW-VIM throughout the paper to avoid confusion. (http://www.wmo.int/pages/prog/arep/gaw/documents/Final_GAW_213_web.pdf)

Line 138 – Please cite original papers or sources closer to the original studies see e.g. Allan 1987 (IEEE Transaction on instrumentation and measurements, IM36-2, 1987)

Line 163ff – Please consider adding a signifier for the upgraded G1101-i e.g. G1101-i* or G1101-iup to clearly and efficiently distinguish the instruments in the plots and following text.

Line 187ff – I would suggest to summarize the key results presented in this section in a table, which could make the text easier to read.

Line 293ff – Similar work has been conducted for CRDS instruments for GHG concentrations, e.g. Yver-Kwok et al. 2015 (AMT-8-3867-2015) investigated the cross-

sensitivities (e.g. for H2O) of over 60 instruments. This could be a useful reference.

Line 337 – Please cite the appropriate publication by C.D. Keeling here

Line 338f – Please expand if the uncertainties given include the full error budget or are the uncertainty of the fit (fitting algorithm?).

Line 381ff – see general comments

Line 392ff – the importance of compatibility between difference instruments can be easily agreed upon. However, the potential problems caused by non-compatibility could be easily illustrated here (e.g. Levin et al. 2012, Nature, doi:10.1038/nature11175). The difference in the keeling intercept decreases from 1.24permil to 0.36permil, but what are the scientific implications of this? Why is 0.36permil good enough and 1.24permil not? Please given an example of an application or demonstrated how/if the higher bias of the d13Csource would lead to different scientific interpretations of the observations.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-95, 2016.