Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-329-RC1, 2018

Atmospheric Measurement Techniques Discussions
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Interactive comment on "Characterization of lower-cost medium precision atmospheric CO_2 monitoring systems for urban areas using commercial NDIR sensors" *by* Emmanuel Arzoumanian et al.

Anonymous Referee #1

Received and published: 31 October 2018

This paper reports a series of experiments evaluating one particular low cost CO2 sensor. The paper is not especially well organized. It reads as a long list of experiments. However, analysis that synthesizes the observations and context from other related work is lacking.

There is an extensive knowledge base of performance for such NDIR instruments, including manufacturer literature (e.g. LiCor, Vaisala), and field evaluation in other contexts.

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Discussion paper

Key ideas in the description of NDIR sensors that this paper could be better organized around include:

1) that they measure absorption which is proportional to number density but the atmospheric quantity of interest is dry air mixing ratio. The measured quantity must be converted using the ideal gas law and subtracting water number density to give the dry air mixing ratio. Many of the figures are some form of confusing intermediate product along the way to a dry air mixing ratio.

2) that a second order correction is associated with pressure broadening of the CO2 absorption lines.

3) that knowledge of zero is as challenging as knowledge of response to CO2.

The paper neglects to acknowledge or build on related work by Shusterman et al. Atmos. Chem. Phys., 16, 13449-13463, 2016 and Zimmerman et al. Atmos. Meas. Tech., 11, 291-313 2018 and likely others.

Overall I recommend a substantial revision to improve the clarity. Cutting the number of figures in half and targeting them to identified issues with performance would be welcome.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-329, 2018.