

Interactive comment on “Bias Correction of Long-Path CO₂ Observations in a Complex Urban Environment for Carbon Cycle Model Inter-Comparison and Data Assimilation” by T. Scott Zaccheo et al.

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The authors would like to thank Reviewer #2 for their very insightful comments. Each comment (indicated by C:) is listed below along with individual responses denoted by R:

Specific Comments

C: p.11 l.4: “on-line position” -> “off-line position”

R: The reviewer is quite correct. It should be off instead of on, and will be corrected in the final draft. Thank you.

C: Table 1: The table heading “Average Wavelength Offset (GreenLITETM-in situ)” is not very correct expression.

R: The authors agree with the reviewer. The label will be changed to “Average Wavelength Offset (Nominal - Postprocessed)”

C: It would be better to add a brief description on GreenLITETM hardware system including key words such as “DFB laser diode” and “Semiconductor optical amplifier”. Otherwise it is not possible to figure out the hardware system without seeing Dobler et al. 2017.

R: The focus of this paper is to describe a method of correcting a difference between a long open-path differential absorption measurement and a point concentration measurement and not to fully describe the hardware which has been the subject of previous publication. We provided an overview of the measurement method that describes how the measurements are being made, which seems adequate for the purpose of this paper.

C: p.3, l. 24: The following description seems not correct. “the common mode terms cancel out for the IMCW approach but would be independent for the better-known pulsed method.” Common mode terms are cancel out with pulsed methods too.

R: There are a number of terms that are not common mode for pulsed implementations that are for the IMCW approach. The key advantage of the IMCW approach in this regard is the simultaneity of the online and offline signals both in transmission and reception. For example, a pulsed method will see a slightly different ground reflectivity for the online versus the offline due to the time delay between pulses that is not present for the IMCW approach where the same ground spot is simultaneously sampled. Other examples include: 1) atmospheric scintillation, 2) receiver electronics and detector

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noise, and 3) optical amplifier noise, each of these are independent terms for the two time-delayed channels of a pulsed system but are common for the IMCW approach. We propose to change the text to more accurately state:

“Since the differential transmission is determined through a ratio of the transmitted and received signals at the different wavelengths, there are a number of terms that are common mode for the IMCW approach due to simultaneous transmission of the online and offline wavelengths that cancel out but would remain independent for the better-known pulsed method.”

Versus original text

“The design is such that several noise sources are now common mode due to the simultaneity. Since the differential transmission is determined through a ratio of the transmitted and received signals at the different wavelengths, the common mode terms cancel out for the IMCW approach but would be independent for the better-known pulsed method.”

C: The observation site names are sometimes difficult to follow. Is “CTI tower” the same as “the roof of the lower of the two Montparnasse building”? Jussieu (p.8. l. 33) should be QUA. It would be better to indicate the GreenLITE site names in Fig. 1.

R: The authors agree with the review. All the references to CIT, Jussieu, CDS and QUA have been review and changed to the following consistent set of identifiers: CIT has been defined as the “Tour CIT Montparnasse building (CIT)”, JUS/Jussieu as the “the Jussieu tower at UPMC (JUS)”, CDS as the “Cite des Sciences et de l’Industrie (CDS)” and QUA as the “QUALAIR

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