

Interactive comment on “An improved water correction function for Picarro greenhouse gas analyzers” by Friedemann Reum et al.

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Among some other points, the main concerns of the reviewer are (1) the influence of the drying cartridge, which was used for shielding the external pressure sensor against water vapor changes, especially on CO₂, and (2) the validity of the relationship between external pressure sensor reading and Picarro cavity pressure, due to certain components of the experimental setup (drying cartridge, needle valves). As we explain in our attached reply, concern (1) is unfounded due to our experimental setup. Concern (2) requires more attention and we acknowledge that there are uncertainties in the external pressure readings (however, these are discussed in the manuscript). We address all comments of the reviewer in the attached reply. After reading the review, we believe that in our efforts to write a concise paper we may have kept certain

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sections too brief. In a revised manuscript, we will add the clarifications given in the responses in the cases where they were not present in the manuscript that we initially submitted. However, we would like to emphasize at this point that the uncertainties regarding the external pressure measurement have no influence on the main message of our study, i.e. improving the empirical water vapor correction for CO₂ and CH₄ readings of Picarro GHG analyzers. One of our major results was that coefficients for the improved empirical water correction can be obtained even without external pressure measurements. The external pressure measurements were mainly used to infer whether or not the observed shortcomings of the traditional water vapor correction – i.e. systematic, water-dependent biases in the corrected CO₂ and CH₄ data – were artifacts of water correction experiments and should thus be ignored. Even though there are uncertainties associated with the use of the external pressure sensor, the information obtained from this instrument served very well for this specific purpose: Our experiments with external pressure monitoring revealed that the shortcomings of the traditional water vapor correction can be linked to pressure changes in the cavity of the Picarro analyzer, and therefore should be corrected for. Accordingly, as the main objective of the presented study we provided a way to correct for the effect. This summary statement and the more detailed comments in the attached response aim at clarifying the rather minor role of the accuracy of the external pressure measurements. We believe that the concerns raised by the reviewer regarding this element of our study should not put the validity of the overall findings into question.

Please also note the supplement to this comment:

<https://www.atmos-meas-tech-discuss.net/amt-2017-174/amt-2017-174-AC1-supplement.pdf>

Interactive comment on *Atmos. Meas. Tech. Discuss.*, doi:10.5194/amt-2017-174, 2017.

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