Response to “Interactive comment on “Correcting atmospheric CO2 and CH4 mole fractions obtained with Picarro analyzers for sensitivity of cavity pressure to water vapor” by Friedemann Reum et al.” by Anonymous Referee #1.

We thank the referee for the comments on the discussion paper, which address minor issues. In the following, we address each comment.

Comment:
p2 l5 networks

Response:
To avoid confusion, we replace the phrase “are used at many sites of the international GHG monitoring network“ with “are used at many GHG monitoring sites“.

Comment:
Fig 1 or 2 Please draw one of the set-up for the flight model and one for the other so the differences between the set-up are clearer.

Response:
We will modify Fig. 1 and its caption accordingly.

Comment:
p12 Fig6: why are the the coefficients so different between O2 line and optical phase length?

Response:
We assume that the comment refers to the different signs of the slopes of the cavity pressure estimates. This was addressed in the text, but to make it clearer, we will include a reference to the corresponding text section in the figure caption:
“The slopes of the cavity pressure estimates based on spectroscopic methods differ because they are compounded by other effects (see Sect. 2.3.2).”

Comment:
p14 Fig7: Why using equation 5 or 6 yields different results?

Response:
The difference is that Eq. (5) makes use of independently measured cavity pressure (in these cases with the external pressure sensor), while Eq. (6) uses the empirical dependence of cavity pressure on water vapor. In other words, the difference is due to the noise of the independent cavity pressure measurement (assuming the empirical model is accurate). We will clarify this in the caption of the figure:
Before: “Dry air mole fractions from the experiment with Picarro #3 based on the three water correction models.”
Corrected: “Dry air mole fractions from the experiment with Picarro #3 based on standard water correction model, pressure correction model (i.e. using independently measured cavity pressure) and expanded water correction model (i.e. using the empirical dependence of cavity pressure on water vapor).

Comment:
Table 7 is not fully clear with the text, I'm not sure where the expanded model biases are shown.

Response
The biases of the standard water correction model in Table 7 were based on the assumption that the expanded model was unbiased. This was stated in the caption of the table, but we will also add it to the section on the bias of the standard model.
Before: "Maximum biases of standard model (individual experiments)"
Revision: "Maximum biases of standard model assuming the expanded model was unbiased (individual experiments)"

Comment:
p19 l6 where the water vapor mole fraction was selected...

Response:
We will correct this typo as suggested.