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Atmospheric Measurement Techniques Discussions

Interactive comment on "Water vapor $\vec{\delta}^{2}$H and $\vec{\delta}^{18}$O measurements using off-axis integrated cavity output spectroscopy" *by* P. Sturm and A. Knohl

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We thank reviewer #1 for the comments and corrections and would like to respond as follows:

1. p2063, l21-22: We have included the reference Frew et al. (1995) and changed the range of d18O precisions accordingly.

2. p2066, l10-13: Although it might not be surprising that the nonlinearity is the same irrespective of the isotopic composition, we think that it is still worthwhile to mention it. In our experience this question often comes up as it is not obvious at first sight for people which are not familiar with isotope ratio measurements.

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We have not directly used VSMOW and SLAP for two reasons. First, our calibration system is equipped with a 12mL vial as water storage container and we need a minimum of about 2mL of standard water for calibration. Unfortunately, we did not have that much international water reference material available for calibration. Using secondary standards results in longer traceability chains, but allows to check whether the span between two water reference materials remains constant over time as several liters of material can be prepared. Secondly, our secondary water standards more closely span the observable range compared to VSMOW/SLAP, which improves the link to an absolute scale over the observable range.

3. p2066, l19-23: Cross contamination by impurities in the sample is a critical issue for water isotope laser spectroscopy in general as it is also known from other studies (i.e. Brandt et al., 2009). However, if the nature of the contaminant is not known, it is difficult to quantify this effect and we agree that the only way to avoid it would be to physically or chemically remove any contaminants in the air. Our approach to deal with a possible contamination effect is different, however, and relies on proper calibration procedures. A periodical determination of the concentration dependence as well as the absolute scale allows us to account for changes in the instrument response due to contamination. Still, it is likely that residual influences of such effects are limiting the measurement precision (in particular for d18O, see also comment 4). We have extended the discussion of this effect and its implications in the text.

4. p2067, l13: We don't think that the limiting factor for the d18O precision is the temperature control. The temperature sensitivity of the d18O is about -0.24 ‰ /°C, so temperature variations of $\pm$0.25°C would correspond to a variation in d18O of about $\pm$0.06 ‰ . But this (small) effect is taken into account and corrected for the presented measurements. The comparatively large variations are presumably rather due to variations in the nonlinearity (see comment 3).

5. p2069, l14-16: see comment 2.

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6. p2076, Fig.1: The droplets are emitted with a velocity of 2-3m/s. The jet of droplets at drop rates >100Hz is visible to the eye and it hits the opposite surface where the droplets evaporate. A detailed description of the droplet generator is given in Iannone et al. (2009). We have extended the description of our dripping device in Section 2.2.

7. p2082, Fig.7: The data in Figure 7 are measurements of standard water from the dripper at constant water vapor mixing ratio. A temperature correction based on these measurements is routinely applied to all raw data.

p2063, l17: We have replaced “The one second standard...” by “The one-second standard...”

p2072, l24: We have replaced “...spectrometry and a case...” by “...spectrometry; a case...”

Interactive comment on Atmos. Meas. Tech. Discuss., 2, 2055, 2009.