

This manuscript, entitled “Intercomparison of Open-Path Trace Gas Measurements with Two Dual Frequency Comb Spectrometers,” reports on a quantitative evaluation of atmospheric trace gas measurements based on dual-comb spectroscopy. Thanks to their well-polished dual-comb spectrometers and analytical approach, the retrieved dry mole fractions agree to 0.57 ppm for CO<sub>2</sub> and 7 ppb for CH<sub>4</sub> between the two measurement systems. These results are excellent, while there are some obscure points in the manuscript. Therefore, I recommend the manuscript for publication if following comments and questions are addressed.

[Specific comments]

1. While I am briefly familiar with the technique of gas spectroscopy, I am not an expert in atmospheric measurement and concerned about some technical descriptions.
  - 1) Is it OK for AMT readers to use some technical terms such as “WMO-calibration” and “WMO compatibility goal” without any simple explanation?
  - 2) L207: I was confused with the expressions of concentration. Is it correct that the dry and wet concentrations of carbon dioxide are expressed as “XCO<sub>2</sub>” and “CO<sub>2</sub>,” respectively?
  - 3) L209: “Volume mole fraction” might be simply “mole fraction.”
  - 4) Figure 5: I found volume percentage is normally expressed as “v/v%.” Is “%v/v” OK too?
2. According to the footnote in P2, “ppm” and “ppb” are used for dry concentration (dry mole fraction) and “%v/v” is for wet concentration (wet mole fraction) as in Figure 5. However, “ppm” is used for ΔHDO and ΔH<sub>2</sub>O in Figure 6 and 7.
3. I think the explanation about dual-comb spectroscopy is a little insufficient. For example,
  - 1) L94 and 97: Authors should refer to Figure 1(a) here instead of Figure 1 and 1(b).
  - 2) L102: I could not understand the explanation “the instrument lineshape is effectively the sum of two delta-functions.” What does it mean?
  - 3) L139: Readers might not be sure whether  $f_r$  is a sampling rate or a bandwidth.
4. L183: Please define  $C_n^2$ .
5. In Figure 4, the observed HDO is 10<sup>-4</sup> %v/v level, whereas ΔHDO is 1000 ppm level in Figure 6 and 7. Are they consistent?
6. In the caption of Figure 8, “40 ppmv/ $\sqrt{\tau}$ ” and “4 ppbv/ $\sqrt{\tau}$ ” might be “40 ppm/ $\sqrt{\tau/s}$ ” and “4 ppb/ $\sqrt{\tau/s}$ ,” respectively.

[Technical corrections]

1. There are some notations without space between the value and unit; for example “1-10s” in L46, “10%” in L51. Please check and correct them.

2. Notation variability, "dual comb" and "dual-comb."
3. L94: Reference (Ideguchi, 2017) is missing in the list of references.
4. L214-215: Notation variability, "three-hour" and "3-hour."
5. L217: A beginning parenthesis is missing.