Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-273-RC2, 2018

Atmospheric Measurement Techniques Discussions

Interactive comment on "Gravimetrically-Prepared Carbon Dioxide Standards in Support of Atmospheric Research" *by* Bradley D. Hall et al.

Anonymous Referee #2

Received and published: 14 September 2018

In this paper, Hall and co-authors prepare highly precise CO2-in-air standard gases for atmospheric measurements by using a one-step gravimetric method. Based on the study of Schibig et al. (2018) and their own experiments, they thoroughly consider the influences of the CO2 adsorption to the surfaces of the cylinder wall and transfer line on the prepared CO2 mixing ratios. Finally, they achieved low uncertainty of about 0.04% for the ambient level of CO2 standard gases. I believe their study considerably contribute to the atmospheric CO2 observation reseach , where maintaining CO2 scale is critically important.

I found that the paper is well written and contains material that should be published in Atmospheric Measurement Technique. I recommend this paper for publication with the following minor revisions.

Printer-friendly version

Discussion paper

Specific comments: Page 3, line 14: It would be better to mention the weight of the 29.5-L Luxfer cylinder.

Page 3, line 23: What are the weighing capacity and the readability?

Page 4, line 17-18: This purification procedure can remove non-condensable gases but cannot remove water vapor. Is it possible to add additional cold trap at -100°C between the 50-mL and 5-mL containers to reduce the water vapor?

Page 6, line 1-2: In Table 1, the suffixes '_a' and '_b' mean 'initially present in cylinder' and 'aliquot in 5-mL container', respectively, while the subscriptions 'a' and 'b' in the text mean the exact opposite. It's very confusing.

Page 6, line 2-3: It would be better to clarify that nair coms from natural air initially present in the cylinder and the dilution gas.

Page 6, line 15: I think the molecular weight of 28.9621 is not for the dilution gas but for natural air including ambient level of CO2. From the composition of the dilution gas listed in line 17-18 (He should be included in the dilution gas) we obtain the molecular weight of 28.9560. Moreover, I think that the molecular weights of the natural air initially added to the cylinder and the dilution gas were needed to calculate the moles of the initially added natural air and the moles of the added dilution gas because these molecular weights are not necessarily same. However, the authors used single molecular weight of 28.9621 for the air with ambient level of CO2 to compute nb and nair because the differences in the molecular weight among these airs doesn't practically cause significant differences. I think the authors should clarify how to compute the moles of the gases used in this study.

Page 7, line 12: What is the BOC Spectra Seal process?

Page 13, Table 1: I think it would be better to add the column of the total uncertainty for XCO2.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-273, 2018.

Printer-friendly version

Discussion paper