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Atmospheric Measurement Techniques Discussions

Interactive comment on "Calibration of atmospheric hydrogen measurements" *by* A. Jordan and B. Steinberg

Anonymous Referee #1

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General Comments.

The manuscript 'Calibration of atmospheric hydrogen measurements' by Jordan and Steinberg, Atmos. Measurement Tech. Discuss., 3, 4931-4966, 2010 details work describes work which is of critical importance for the community studying atmospheric H2. As noted in the paper's introduction, problems with analytical methods, calibration scales and drift in reference gases have all limited the accuracy of previous measurements. This manuscript solidly addresses each of these issues by providing a thoroughly documented calibration scale; evaluation of the commonly used method of GC with mercuric oxide detection; and study of H2-in-air stability in cylinders of various composition. The paper is suitable for publication in Atmos. Measurement Tech.

Discuss.

I recommend publication of this work after the authors consider the comments below. In particular, the various sets of standards discussed in the manuscript could be better clarified.

Specific comments:

P. 4934, L. 25: 'Stable reference standards' are one way to ensure accurate measurements but not the only approach; perhaps 'reproducible standards' is better.

P.4935, L. 22: Why was peak height chosen to quantify the peak rather than area? Does it make a difference which approach is used?

P. 4936, L. 5-7: I suggest the authors revise '. . . made relative to a set of standard gases. . .'? by replacing 'set' with the number of standards.

P.4937. What is the point of the 13 air mixtures discussed in section 2.2 and Table 1? Do the 53 reference gases listed in Table 2 define the new scale? It is not clear why the comparison with CSIRO in Table 1 is presented before the MPI standards are discussed. This might be moved to after Section 2.3. In the summary it is stated that 13 standards make up the new scale. Are these the same as those in Table 1? Does the scale include the Luxfer 50 L Al tank?

P. 4941, L. 1-2: The mean offset between two data sets over time may not show drift. The authors should fit the data vs. time and determine the change and uncertainty.

P. 4941, L. 15-30, P. 4942, L. 1-13; Figure 4: Some additional detail and discussion would benefit this section. 1) Are the US N265 tanks 265 L.? They appear as stable as the steel tanks. The caption for Figure 4 says these are Luxfer Al tanks purchased from the Conwin Carbonic Co. Were they treated in any way? Is the difference in stability between the 150 and 265 Luxfer tanks due to size or treatment? 2) What kind of steel cylinders were tested? Were they all from the same manufacturer? Were they the same size, steel or stainless steel, treated or not? 3) Did the cylinders all hold the

same type of valve? If the cylinders that were found to drift were refilled did they still show increasing H2 over time?

P. 4943, L. 26: Is the first time the H2 generator mentioned previously? If the generator was used for the preparation of the 'primary' standards it should be mentioned on page 4939.

P. 4944, L. 21: How significant was the H2 change in valves fitted with the Valcon-E rotor? Is this something one needs to consider when setting up the analytical system?

P.4945, L. 4-6, Table 2: The number of experiments (n) used to determine the uncertainty for each source of error should be included.

P. 4945, L. 24-25: rewrite these as '. . .working standard results in. . .?'

P. 4946, L. 2: 'no' should be 'not'.

Figure 3: Are the drift rates for the series of calibrations significant? The rates and error should be given in the figure caption.

Figure 5: How many tanks were used in each test? If only one tank was examined for each alloy the results could be biased as drift rates may vary among cylinders of the same type.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 4931, 2010.