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Atmospheric Measurement Techniques Discussions

Interactive comment on "Catalytic oxidation of H₂ on platinum: a method for in situ calibration of hygrometers" *by* A. W. Rollins et al.

Anonymous Referee #2

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General Comments: This manuscript describes the design and testing of a system for producing known quantities of water vapor from the oxidation of molecular hydrogen on a heated platinum surface. The motivation for the development of this technique is the need for a method with which to perform in situ calibration of airborne hygrometers. Numerous comparisons of airborne instrumentation for measuring water vapor, particularly in the upper troposphere and lower stratosphere, have revealed considerable disagreements for water mixing ratios less than 10 ppm that are not completely reproducible in the laboratory. The technique described in the manuscript could potentially fill an important gap and could help to resolve long-standing issues about UT/LS water vapor.

Specific Comments:

* I think the title of the manuscript is a bit misleading, since the article does not describe testing of the technique "in situ". There are a host of technical hurdles to overcome for the implementation of this technique in flight, so I think it would be better to have a title that does not include the phrase "in situ" until this aspect has been proven.

* Since the evaluation of the accuracy of the technique depends on knowing the inputs very well, the authors should say more about the calibrations of the various components of their laboratory system. For example, it is stated on p 3086, lines 19-20, that flow controllers are calibrated to an accuracy of +/- 1%, but nothing is mentioned about the accuracy and precision of the "standards" – the DryCal flow meters. Similarly, the authors state that the zero air was observed to contain less than 0.5 ppm H2O, but they do not describe on what basis they know this.

* One of the challenges with any type of calibration technique is knowing its absolute accuracy. I find it curious that the authors have chosen to reference all of their work to one or two frostpoint hygrometers. While the MBW and FPH may be represented as quite accurate (reporting frostpoints to +/- 0.1 oC), they are also potentially subject to biases and these biases will then propagate into the new calibration system. The authors are surely aware that the in situ measurements reported by the NOAA FPH are nearly always at the lowest end of the range of in situ techniques and that many have questioned the accuracy of the frostpoint method because of concerns about this and the inherent errors in the various algorithms for converting frostpoint to mixing ratio. It would be nice to see checks performed on this new calibration technique against other methods for determining water vapor or for producing known amounts of water vapor.

* Figure 2 would be more useful if the y-axis were % conversion rather than absolute H2O amount

* Figure 3 should show errorbars for the measured H2O based on the uncertainty in the frostpoint measurement, plus the conversion from frostpoint to water mixing ratio

Technical Corrections:

* Page 3089, line 2, “pressurezed” should be pressurIzed

* Page 3089, line 6, “. . . controllers used are unaffected. . .” should be “. . .controllers used IS unaffected. . .”

* Page 3089, line 23, “impliment” should be implEment

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 3083, 2011.