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Atmospheric Measurement Techniques Discussions

Interactive comment on "CO_2, CO and CH_4 measurements from the NOAA Earth System Research Laboratory's Tall Tower Greenhouse Gas Observing Network: instrumentation, uncertainty analysis and recommendations for future high-accuracy greenhouse gas monitoring efforts" *by* A. E. Andrews et al.

Anonymous Referee #2

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Journal: AMT Title: CO2, CO and CH4 Measurements from the NOAA Earth System Research Laboratory's Tall Tower Greenhouse Gas Observing Network: Instrumentation, Uncertainty Analysis and Recommendations for Future High-Accuracy Greenhouse Gas Monitoring Efforts Author(s): A. E. Andrews et al. MS No.: amt-2012-270 MS Type: Research Article Special Issue: Carbon dioxide, other greenhouse gases,

and related measurement techniques - 16th WMO/IAEA meeting (GGMT-2011)

General comments This paper by Andrews et al describes the NOAA tall tower measurements of CO2, CH4 and CO dry mole fractions. As the authors mention, the instrumentation to measure these gases has evolved since the beginning of the NOAA tall tower program and now cavity ring-down spectrometers make these measurements easier. But I agree that this paper is a useful contribution to the literature and I appreciate the practical advice. For example, using a valve on the inlet to be able to test for leaks in the sample line, using dry ice to test for leaks (and using a hand-held sensor to make sure levels aren't too high for safety!), and checking for a torn diaphragm by capping the inlet and checking the flow. The length of the paper could be reduced by eliminating or moving to the supplement descriptions that are specific to NOAA or could be done many ways. For example, the first three paragraphs in Section 5.1 are not very helpful, except that three days of calibration data are used. Combining Figures 1 and 2a-e would save space.

Specific and technical comments

p. 1463: Accurate measurements of atmospheric CO2 do not, by themselves, provide an objective basis for verifying reported emissions. We need models to make that connection.

p. 1464: Regarding the statement that the typical sampling footprint is 1/10th the area of the contiguous U.S., other studies (Lauvaux et al. 2008; Gerbig et al. 2009) emphasis the importance of the near field.

p. 1465: "Background values of CO2 are relatively high (currently ∼390 ppm) and vary with latitude, altitude, and time, so signals from individual sources are rapidly diluted, becoming faint." I don't see the connection in this sentence.

p. 1469: Please explain why the Reynolds number is relevant here. Also could use just the average value, since the exact number is not important and the repeated parenthe-

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ses are awkward.

p. 1484: “Leaks within the field laboratory” ... missing word.

p. 1482: “Recent studies have shown that Picarro measurements of CO2 and CH4 can reliably be corrected for water vapor effects.” True, if you want to characterize each instrument individually and re-check periodically. Otherwise, there are problems at high water vapor values.

p. 1491: “It’s uncertainty is ∼0.7 ppm.” Too casual, plus there should be no apostrophe in any case.

p. 1491: “14 cylinders had absolute differences > 0.1 ppm.” How much larger than 0.1 ppm?

p. 1514: “fantastic resource” reword

p. 1515: “We recommend deploying any analyzer with two or more additional cylinders than required to generate a calibration curve.”

Table 2: This table is very specific and could be removed or put in the supplement. Also I’m not sure why (CO2, CO, CH4) follows “Water content of the sample flow”.

Figure 2: Is there any way to combine Figures 1 and 2a-e into one figure? That would take up less space and eliminate repeated legends. Also consider writing out “sample” instead of abbreviating as “sam”.

Figure 4: no a or b in the figures. In a) this is the CO2 compared to the reference cell? Units are ppm? In b) what are the units? Seems high for CO in ppb?

Figure 6: In a) the baseline is compared to the reference cell?

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 1461, 2013.