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Atmospheric Measurement Techniques Discussions

Interactive comment on "Comprehensive laboratory and field testing of cavity ring-down spectroscopy analyzers measuring H_2O, CO_2, CH_4 and CO" *by* C. Yver Kwok et al.

Anonymous Referee #2

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Yver Kwok et al. 2015 present the testing results of a large number of CRDS instruments (47 in the laboratory and 15 in the filed) in terms of short-term and long-term repeatability, temperature and pressure dependence, linearity, and instrument long-term stability, which is very useful for deploying the CRDS instruments in the field. It is particularly useful that the paper has discussed the potential source of the long-term stability, suggesting that the stability of the cavity pressure may be the cause. Furthermore, the authors formulated recommendations for use of the CRDS instruments in the field. The test results are comprehensive, and the paper is well organized. I recommend publication after addressing the comments below.

General

The testing results are no doubt comprehensive, however, a rigorous discussion on the conclusions and recommendations is missing, which makes the recommendations difficult to follow, and/or not justifiable in the paper. For example

For recommendation #1 “Instruments should be tested in the laboratory before being on site”. Why should the instruments be tested, and in what particular sense? The paper shows the testing results from the factory, from the MLab, and from the filed agree well with each other. Why not taking the testing results from the factory and from the field, instead of testing the instruments in the laboratory? What additional information shall we get by testing the instrument in the laboratory?

For recommendation #2 what is the target precision/accuracy to have the measurement duration of 10 minutes?

For recommendation #3 what is the consequence of having the pressure difference between the different samples/standards higher than 0.4 bar? A spike would occur during the switch of course, but does it matter? I would think not.

For recommendation #4&#5, I expect to read the recommended frequency of the calibrations, instead of obvious

Details

P4226, L17-19: what is the significant inlet pressure influence?

P4228, L4: it is needed to clarify which temperature and pressure values are being discussed, i.e. ambient vs. cavity.

P4232, L19: CO2frac is defined as a function of the slope and intercept, how is ΔCO2frac defined?

P4233, L1: replace “intersects” with “intercepts”

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P4235, L26: replace “in term of” with “in terms of”

P4236, L7: has the change of the room temperature affected the cavity temperature? What would be the reason of the temperature dependence?

P4237, L3: Which part has been changed during the upgrade to reduce the temperature dependence?

P4240, L14: How does the drift rate compare with other available data? e.g. Karion et al., 2013 and Richardson et al. 2012. Is a linear drift correction needed? Noting that in Richardson et al. 2012 “Although it is likely that the slope and zero of the linear calibration drifted over the deployment period, the error associated with correcting with an offset rather than a slope and offset is small (e.g., 0.03 ppm at Kewanee and 0.02 at Mead over a 370–400 ppm range) ”.

P4241, L11-12: I see the trend toward both increase and decrease of the concentrations of CH4. Did you mean both?

P4259, Figure 7&8. I suggest adding the number of instruments showing this temperature dependence in the caption, although it has been mentioned in the main text.

P4264, Figure 12, How is exactly the virtual tank with a fixed value after calibration defined? Is the initial laboratory calibration equation used in the calculation?

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 4219, 2015.