Review of the manuscript: "Calibration and Field Testing of Cavity Ring-Down Laser Spectrometers Measuring CH4, CO2, and δ13CH4 Deployed on Towers in the Marcellus Shale Region", submitted to Atmos. Meas. Tech. , by Natasha Miles et al.

The paper is describing the measurements of atmospheric mole fractions of δ13CH4, CH4 and CO2 at four sites in Pennsylvania. More precisely the manuscript describes the optimization of the technical setup based on lab and field tests.

The manuscript needs to be reorganized to reduce the back and forth between test descriptions and their results, which makes the reading quite difficult. There are too many redundancies, and unclear statement. When doing that I also suggest to shorten the manuscript. Some conclusions appear obvious, like for example the statement that field calibrations significantly improved the measurements compatibility. Also the so-called optimal calibration strategy refers to the design which was decided a priori and slightly modified during the campaign, but there was no plan to really evaluate alternative design. The conclusion should be written in a more concise way, focusing on the recommendations gained from the experiment.

Introduction: the introduction need to be reorder in order. For example the first paragraph of page 4 describing the interest of tower versus aircraft, appears between two paragraphs discussing more technical points about CRDS measurements

Page 4 / Line 13: "three field calibration tanks…": I would rather say two calibration tanks plus one target tank used as quality control and not used in the calibration.

Allan variances tests; calibrations tests (Page 6 / Line 31): there are many back and forth between description of the set up and the results, which confuse the paper.

Page 9: In-situ field calibration: is the Nafion required for the setup ? Have you compared possible biases due to the use of the Nafion versus the water vapor correction ? I am not fully convinced by the strategy of humidifying the dry calibration tanks.

Page 9: 4 min flushing: how do you estimate those 4 minutes as sufficient for the flushing ?

Page 12: background site: why don't you select the background site as a function of wind direction rather than picking up one site for the full period ?

Page 14: Allan results: For CH4 and CO2 it should be noted that the results seem to be not as good as the performances obtained with G1301/G2401 analyzers. Do you know the reason which could explain a difference of the performances between those analyzers ?

Page 16: Calibration scheme: the presentation of the different tests should probably be shortened. Is there a difference between Expt E and H designs ? I would appreciate an evaluation of the optimum frequency of the field calibration sequences (intermediate between 0 and once per day). From the variabilities shown on Fig.8 and 9 it looks like a reduction of the calibration frequency to once every few days would not affect by much the measurements.

Fig.8: the legend is misleading since the so-called target tank is used as a calibration tank. To make it clear you should add comments in the legend of each figure (e.g. Target tank (used as CAL))

Page 17: Fig. 9B and 9C should rather be 9A and 9B

Page 20 Line 27: suppress 'For the daily afternoon averages,'. Not clear what you mean by a 'reduction' of 0.6-0.7pmil.

Page 20 Line 32: Why do you compare CH4 enhancements (6ppb) with 13CH4 target compatibility (0.2pmil) ?

Page 21: lines 22/23: Unclear statement about the dilution of local source. The discussion about the source signature need to be clarified, or preferably merged in the discussion section.

Page 23: lines21/22: unclear statement.

Conclusion: in your last sentence I would like to see also a comment or discussion that the strategy of using continuous measurements at four tower is maybe not the optimal one for the quantification of such sources.