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Atmospheric Measurement Techniques Discussions

Interactive comment on "System for δ^{13}C-CO_2 and $x$$CO_2$ analysis of discrete gas samples by cavity ring-down spectroscopy" *by* Dane Dickinson et al.

Anonymous Referee #2

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Dickinson et al. present a new and rather simple method that can easily analyze small discrete gas samples using a commercially available cavity ring-down spectroscopy gas analyzer. The major advancement in the performance of the system, compared to other methods, is a two-fold improvement in the throughput rate, which may be appreciated when such a system is regularly used for analysis of a large number of samples in the laboratory, as is the case described in the manuscript. Although it was developed for analysis of xCO2 and δ13C-CO2, the method can be extended to analyze other species with similar instrumentation. My general impression is that the real content of the manuscript is thin, and a significant part of the text focuses on apparent technical description/maintenance rather than technical advancement. For example, it is unclear whether there is any advantage in the precision/accuracy of

the system compared to other methods, other than the precision improvement of the commercially available CRDS itself. The accuracy of the measurements is not included due to the separation of one story into two manuscripts that are simultaneously in review for two different journals, which I found it, at several places, inconvenient to be forced to read another manuscript of the same author to obtain necessary details. Considering the abovementioned points, I strongly recommend (even I know it is hard to convince) the authors combining the two manuscripts and publish one piece of nice work. One good paper is worth more than two OK papers.

Other comments:

1) Comparing the precision of the system and that of previous systems, how much of the improvement is due to the enhanced spectroscopic sensitivity of the CRDS?

2) The method uses $\sim$30 sample data for the analysis. Have the authors considered making a curve fit to the data set and using the steady value of the fit instead? In this way, the measurement will not be sensitive to the baseline signal any more.

Detailed comments:

P3/L29: what does "stable operation" imply here? As the cavity temperature is strictly controlled, is any difference expected if the whole system is located in an unconditional room?

P5/L26: Can the authors explain why zero air (0.05 ppm CO2) is included and why is the range claimed to include the zero air? I do not see the value of adding zero air, and the isotopic signature of the zero seems strange.

P5: I wonder whether there is systematic but significant bias between the "true" value of the syringe sample and the bottle sample, which could be introduced during the sampling process.

P10/L10: Were the 9-month period measurements calibrated? It is difficult to judge when the accuracy of the system is not mentioned in the manuscript.

P10/L31: The traditional continuous-flow IRMS can do much better than ∼0.1‰.The reference should not be limited to an old paper Prosser et al., 1991.

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