

Interactive comment on “High accuracy measurements of dry mole fractions of carbon dioxide and methane in humid air” by C. W. Rella et al.

Anonymous Referee #2

Received and published: 20 December 2012

Review Atmos. Meas. Tech. Discuss., 5, 5823–5888, 2012 www.atmos-meas-tech-discuss.net/5/5823/2012/doi:10.5194/amtd-5-5823-2012 Title; High accuracy measurements of dry mole fractions of carbon dioxide and methane in humid air

Authors; Rella, Chen, Andrews, Filges, Gerbig, Hatakka, Karion, Miles, Richardson, Stienbacher, Sweeney, Wastine, Zellweger.

General Comment I am familiar with all the scientists, their work, and the activities of all their associated collaborators, and I am quite familiar with the CRDS technologies. All these scientists have a long track record of advancing our understanding in

C3344

atmospheric sciences and working collaboratively with larger projects. This is a timely manuscript, and has broad application to your readership.

I greatly appreciate all the hard work that has gone into this study and writing this manuscript. I have 3 basic comments, which are easily remedied. First, The science is basically sound, but is not reproducible. I know what the authors meant to say, but do not say it. The large amount of jargon and imprecise writing bogs down the reader. Moreover, there are numerous locations in the text that does not describe the methodology sufficiently enough to make the paper reproducible. A key issue is the how the authors choose their averaging times. I know they have Allen’s variances, which should use as part of their justifications. Ultimately, the manuscript must be scientifically objective, and make the methodology transparent and reproducible for this sensor to be considered by the research community. Second, It is always tricky for good scientists under the employment of a private corporation to publish – in this case, this manuscript does not appear to offer objective, well thought out and reproducible data to support their claims (I know they their intent is to be far and open, but the style of writing is filled with vendor jargon and descriptors that read more often like an advertisement.) It reads far more as an advertisement than objective science, and at time, the results follow the same (lack of) scientific rigor. This should be edited out to make it transparent and accessible by a broader audience. The authors are better served by having independent analyses done by outside Principal Investigators, at least as first author. Lastly, the style, tense, voice, and imprecision of the writing does not lend to an easy manuscript to read, understand without the reader asking themselves lots of questions. The style of communication lacks rigor. All these issues have to be made in this manuscript with scientific rigor. Some, not all the issues with writing, are outlined below.

All figures are not consistent publishable graphics. They should be re-worked to provide a storyline with the same graphical resolution, appearance, and consistency of information.

C3345

Specific Comments. P5825, L9 (CRDS) is not needed in the abstract since it is not repeated in the abstract. Abbreviation will be needed in the text P5825, L10 'have led to the development of highly stable and precise greenhouse gas analyzers capable of highly accurate measurements of carbon dioxide, methane, and water vapor.' Highly qualified statement with no citation to back this up. It reads more like an advertisement. Soften the text, or add citation. P5825, L11 remove 'compatibility' are these really termed 'compatibility goals' but WMO? If so, they must be italicized or indicated in way that they refer to a specific criteria, otherwise, remove. P5825, L20 'up to at least 1% water vapor.' Of what? P5825, L22, 23 'least 2% over the life of the instrument,' 2% of what? 4% of what?, unclear. P5826, L2, 'long-lived species' of what? Gaseous atmospheric constituents? P5826, L5 clause 'due to long-lived greenhouse gases' does not make sense, please check tense/text. Moreover it is redundant to the clause in the previous sentence. P5826, L9 add 'globally' to 'of the total radiative forcing globally'. P5826, L9 'accounts' to 'accounted', it is past tense, not infinitive tense P5826, L10 remove 'long-lived greenhouse gases', it is redundant, you have stated as much several times already in the short amount of text. P5826, L14, What is 'over their atmospheric lifetimes.', suggest removal. P5826, L17 add text to 'the magnitude' to 'the magnitude and rate.' P5826, L20, 'validation for estimates' confusing text. Do you mean validation of model estimates? because the measurements themselves are 'estimates' not a validation of anything, unless you specifically call out the validation of [what?]. or just remove 'of estimates'. P5826, L22, 'the atmospheric signals.' is jargon. P5826, L23 'The increasing spatial resolution afforded by these networks is already leading to increased spatial resolution of emissions from global/continental scales' really? Seems either circular logic, or something is missing. Increased spatial resolution of estimates is leading to increased spatial resolution of emissions? 5827, L5 'GC (Gas Chromatography)' flip, Gas Chromatography (GC), ditto on the following lines. 5827, L6 'dried gas streams' jargon 5827, L7 'are only meaningful' why? 5827, L13, again what does 'meaningful data' mean? Unclear. 5827, L14 error means lots of things. What type of error? Systematic bias? Is the bias directional always positive in this

C3346

case (+) or bi directional (+/-)? More description on what type of error this is. 5827, L26 change 'a leaky connection' to 'leaks' 5829, L4 'cross-talk' jargon, re-write. And elsewhere, re. P5835L26 5829, L13, 'of highly stable and precise measurements of' is stating it as fact without prove. As such reads more like an advertisement. Careful crafting to the text is needed here. 5829, L15 add text to read 'the models G1301, ...' 5829, L19 remove 'and described in greater detail in' just reference Crossen 2008 5829, L20 etc. text describing when sensors were available is not relevant to this paper and should be omitted. It continues to make the paper read more like an advertisement. 5829, L24 'interchangeably.' Jargon, rewrite. 5829, L24 'This family of instruments has been adopted throughout the greenhouse gas measurement community, and a great deal of work has been done to establish their performance under humid sample gas conditions.' Reads like an advertisement, rewrite. 5830, L3, 'These analyzers are all based upon cavity ring down spectroscopy (CRDS), an all-optical technology that delivers high stability and precision in a compact, field deployable package.' Reads like an advertisement without backing up these statements with evidence/data/etc. 5830, L8, 'precision' and accuracy? Both? Why just precision? 5830, L10 'control system' what is it controlling, otherwise it is just jargon. 5830, L15 'control loops' jargon, rewrite. 5830, L16, now we are delivering 'accurate' measurements without a definition? 5831, L8 please define 'meg' for those not familiar with this nomenclature 5831, L18, 'the CRDS instruments models described in this manuscript.' Advertisement, omit, or rewrite 5834, L7 'validation measurements.' I do not think this is what you mean. Calibration? Or validation of what? Calibration coefficients? Performance? Inter comparability? 5834, EQ2 what are x and y? empirical coefficients? 5834, L14, '1.5 %.' Is the +, -, or +/-?, unclear 5835, L17, what 'additional noise'? Inherent electronic noise? Precision? Over what averaging period? Something is missing here. Otherwise it is just jargon without qualifying what you mean by 'noise' 5835, L19, 'using the manufacturer guaranteed noise specification of 0.003% for water on the 5min measurement.' Reads like an advertisement. Rewrite 5836, L9, add text 'but with variable humidity.' 5837, L3, 'LI-COR model 610)' needs manufacturer's location 5837, L14 'neighboring dry air measure-

C3347

ments' rewrite. I know what you mean, but it is imprecise writing, please change. 5838, L1, webpage address is sloppy writing, please provide the manufacturer, their location, and model to ensure reproducibility of this experimental design. 5838, L15, 'perhaps the most straightforward implementation of a test method to determine the correction coefficients' seems like a very subjective statement. Needs to be re-worked 5838, L20, 'how is 'equilibrium state' being tested? What are the criteria for 'equilibrium state'? otherwise this is not testable or reproducible. 5839, L1 'Further, the method is somewhat cumbersome and therefore difficult to implement in a field setting.' Seems to contradict the first sentence in this section 5840, L12, 'stainless steel Swagelok filter' imprecise writing, please state the fitting then in parentheses name the manufacturer, their location, and model number, otherwise this is no reproducible, nor consistent with standard scientific writing and notation. 5841, L11, 'Experiments usually take 1–2 h.' why? Seems to be relevant, otherwise this experiment is not reproducible 5841, L15, 'two mass flow controllers' make, location, model?? 5842, L1, 'overall stability' defined as what? Otherwise it is just a word and not reproducible. 5842, L5 remove 'highly'. 5843, L15, "golden" remove 5843, L16, "calibration" why in quotes? Is this a calibration or not? If not, what does this mean. Be very specific and concise in your writing. 5843, L19, 'shipped by Picarro' remove, it is advertisement. 5844, L19, 'an excellent stability over time,' subjective judgment, in the results tell the reader what the difference is? What is the stability, not tell us that it is excellent. Imprecise and subjective writing that is not appropriate.

I could not edit much more because of the repeated poor use of language, imprecise writing, and lack of reproducibility. The remaining part of the manuscript should be reviewed, edited and re-written. Watch tense throughout

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 5823, 2012.

C3348