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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new instrument for stable isotope measurements of ^{13}C and ^{18}O in CO_2 – Instrument performance and ecological application of the Delta Ray IRIS analyzer" *by* Jelka Braden-Behrens et al.

Anonymous Referee #3

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Interesting paper but needs some major revisions. Please find below some listed points that should be changed or at least answered.

1a) Page 2 lines 13ff: text passage about IRMS: Pls cite Schnyder et al. there (citation below) 1b) in the same text passage: I think "sample preparation effort and cost" might be a minus for IRMS techniques. But here the main disadvantages should be mentioned like (storage) problems with vials (see Gemery et al., 1996 and Knohl et al., 2004) and the advantage of quasi-continuous measurements relative to the "discontinuous" measurement by IRMS. 2) Page 2 lines 22ff. text passage about different

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spectrometer types: should be shortened as this manuscript is not a review on optical methods for measurement of isotope ratios 3) Page 3 lines 25ff: “to characterize the Delta Ray IRIS and its performance under field conditions”: I think measurement of the “internal cell turnover” and “Allen deviation” is not sufficient to fulfill this topic here. The reference gas box from the Delta Ray is said to offer possibilities to adjust CO2 conc of the “reference” gas to the measured [CO2] to cancel out a possible concentration effects on the measured d-values. The authors need to go more in detail here by showing data (!) from multiple CO2-in air-standards with different [CO2] and different d13C- and d18O values measured with IRMS (preferred) in comparison to measurement with Delta Ray or a comparison with different optical measurement devices (more problematic). I suppose you have measured the data, so show them here please. 4) Please give more info (citation if available) on the kind of measurements performed at the MPI in Jena (isotopes and concentration). 5) The link to VPDP was done with the gas tank measured in Jena? Please extend the info on how this is done. Fig. 3 describes your quality control standard? Is there a way to compare measured values (+ stdev.) with a target value (+stdev.)? 6) Page 3 line 26 “b)” please add one or two sentences why R13Ceco and R18Oeco is interesting. 7) Page 11 line 21 “lighter” here means only 13C-depleted or also 18O-depleted ? Please specify (also in whole manuscript) 8) Page 13 line 26: more “enriched” in what? Please check that also in whole manuscript, depleted in 13C, enriched in 18O . . . (page 14 line 21 . . .) 9) I‘m not totally happy to read a manuscript with 2 hypotheses where one hypothesis can be discarded but the 2nd one cannot be proven. The authors should find a way around this, at least the additional measurements for finally testing should be mentioned and discussed here 10) the unit “‰‘ is not conform to the SI unit system, what about using “mUr”? It might be more a editorial decision . . .

Gemery et al. (1996): Oxygen isotope exchange between carbon dioxide and water following atmospheric sampling using glass flasks. J Geophys Res 101, D9, 14514-14420. Knohl et al. (2004): Kel-FTM discs improve storage time of canopy air samples in 10-mL vials for CO2-d13C analysis. Rapid Comm Mass Spectrom. 18, 1663-1665.

Schnyder et al. (2004): Mobile, outdoor continuous-flow isotope-ratio mass spectrometer system for automated high-frequency 13C- and 18O-CO2 analysis for Keeling plot applications. Rapid Comm Mass Spectrom. 18, 3068-3074.

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