

Interactive comment on “Non-destructive estimates of soil carbonic anhydrase activity and soil water oxygen isotope composition” by Sam P. Jones et al.

Anonymous Referee #2

Received and published: 5 September 2017

GENERAL COMMENTS The manuscript “Non-destructive estimates of carbonic anhydrase activity and soil water oxygen isotope composition” by Sam Jones and coauthors reports and discusses a new method to estimate the activity of carbonic anhydrases in soils using isotopic measurements of soil carbon dioxide. The suggested method was tested, for the purpose of this study, using controlled laboratory soil incubations. The objectives of the study are well motivated and explained. The abstract is well-written, clear and informative. The introduction is also well structured, well written and clear, both in terms of the limitations of the currently usually used modeling approach, and about the potential benefits of the new method. The methods are in general explained well and in detail (but see below). Also the discussion is written logical, clear and con-

C1

vincing. I have a few major comments that I would like the authors to consider and address during revision. To start with, the statistical analysis of the data should be improved, and that part of the Methods description should be elaborated and improved. As statistical method to assess the treatment effects in this study I recommend linear mixed effects models, see e.g. [Gueorguieva and Krystal, 2004; Crawley, 2009]. I noted that the reference that is currently used in the Statistics part is missing on the reference list (Mendiburu, 2016). Moreover, the Results section should be improved. In long parts many values are listed, e.g. means and error estimates for several parameters and treatments are spelled out in the text. I suggest to check which values are already given in the Tables, and to consider moving more of the values currently given in the text into Tables to refer to. Also, the authors are using many acronyms throughout the text. I find they are too many and this makes the text in parts hard to read. I suggest to reconsider which acronyms are central and to keep these, but consider to spell out certain variables (i.e. avoid too many acronyms). Alternatively, you might add a list of acronyms to the manuscript and refer to it repeatedly, to facilitate for the reader to look up the meaning of all acronyms during reading. Please check as well that all acronyms are actually defined upon first use, and consider to even define acronyms that are common in your field but may not be obvious to all readers of the article (e.g. VPDBg and VSMOW-SLAP). The same applies to the Tables and Figures, please include in footnotes or legend the meaning of the used acronyms (if you decide to keep them), with the goal that Figures and Tables can be understood independent of the text. As example I refer to the legend of Fig. 6, which contains four acronyms and is difficult to understand in its current form. In Figure 5, please add confidence intervals to the regression lines. This may not be feasible in terms of clarity for Fig. 4, which contains many regression lines in one graph. In that case please add a note to the legend of Fig. 4 why confidence intervals are not shown. In summary, I find this an interesting and important study that is well thought out, conducted, analysed and discussed. However, I recommend major revision of, mostly, the Results section and parts of the Methods section according to above comments, as well as improvement of

C2

the Statistical Methods used for data analysis and its description.

SPECIFIC COMMENTS -P6/L4: Please add a reference for the assumed particle density [Linn and Doran, 1984].

TECHNICAL CORRECTIONS - P1/L11: Move the comma: "... , a group of enzymes that catalyse the hydration of CO₂ in soils and plants,..." - P5/20: "were monitored" (change from "was") - P9/L13: "R Development Core Team"

References Crawley, M. J. (2009), *The R book*, 942 pp., John Wiley & Sons Ltd, Chichester. Gueorguieva, R., and J. H. Krystal (2004), Move over ANOVA, progress in analyzing repeated-measures data and its reflection in papers published in the archives of general psychiatry., *Archives of General Psychiatry*, 61, 310-317. Linn, D. M., and J. W. Doran (1984), Effect of water-filled pore space on carbon dioxide and nitrous oxide production in tilled and nontilled soils., *Soil Science Society of America Journal*, 48, 1267-1272.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-453>, 2017.