

Interactive comment on “Carbon isotopes of dissolved inorganic carbon reflect utilization of different carbon sources by microbial communities in two limestone aquifer assemblages” by Martin E. Nowak et al.

Anonymous Referee #1

Received and published: 23 December 2016

General remarks

The manuscript describes the results of an isotope study ($\delta^{13}\text{C}$, ^{14}C) in the Hainich Critical Zone Exploratory that tried to evaluate flow paths in two aquifers systems by inverse chemical modeling.

The manuscript is adequately organized and contains no grammatical or orthography errors. Text is concise and to the point. The English is fine and does not need any revision.

The introduction should more clearly state the objectives of the study. It remains some-

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what unclear what exactly was the aim(s) of the research.

With respect to the conclusions, it remains also unclear if the results obtained at the HCZE can be transferred to other layered karstic aquifer systems on a regional or global scale. The conclusion needs a bit of an outlook and more global perspective at the end. This holds also true for the importance of groundwater resources. At current state, the conclusions are only a summary of the discussion.

The tables were obviously not thoroughly prepared; units are completely missing and Table captions are very brief with most relevant information missing. This needs definitely improvement.

Overall, I would recommend this study for publication in HESS with some minor revisions outlined below.

Specific comments

P1L27 dramatically => considerably/significantly

P3L1 If traditional corrections have been applied – what are then untraditional models? To my knowledge the review by Han and Plummer lists nearly every correction that was published for ^{14}C .

P3L28 To be more clear please add: “according to the stoichiometry of Eq. (1)

End of the introduction: The authors clearly state what they did but not so clearly why. I encourage the authors first to formulate one/some objectives of the study and afterwards mention briefly the applied methods.

P6L10 Any modifications to the cap to make it “gas tight” or the standard blue color Duran bottle caps?

P6L20 Please mention the pore size ($0.45\mu\text{m}$?) and procedure for filtering to distinguish between DOC and TOC.

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P6L29 How was the sample extracted from the 1L Schott bottle since contact with atmospheric CO₂ might alter the $\delta^{13}\text{C}$ of the sample.

P6L30 Sure they were flushed with N₂ not helium? Double-check here.

P7L14 in fact none of the three materials used is rubber, in the sense of butyl rubber (silicone, PTFE and Viton/FKM)? So where does the contamination comes from?

P8L1 pmC => pMC ? (you might also use pmC but be consistent throughout the text); check also on eq. (5), P9L22 etc.

P8L21 here you might simply refer to eq. (4) ?

P8L22 Please be more precise here. Do you mean that the error is the precision of the analysis sequence (e.g. based on the repeated analysis of a control or drift sample)?

P12L1 note that this is the Cambridge half-life time. A (activity) and t (time) should be italic characters.

P13L2 How can you report a value with two digits if your precision is $\pm 0.3\%$ (P7L7)? Also, if your s.d. is $\pm 0.19\%$ it does make any sense to report a value of $-11.66 \pm 0.19\%$. Please change to $(-11.7 \pm 0.2)\%$. Also check numbers in other lines here.

P13L7 For pMC the same applies as for the precision of $\delta^{13}\text{C}$. How can you report a value of 62.23 ± 7.01 pMC? Your s.d. is by far larger than your reported value. I strongly suggest changing these values to (62 ± 7) and (13.4 ± 0.5) pMC.

Same applies for DOC (section 3.3) and 3.4

P15L28 change in preparation to unpublished (might be subject to change latter in the production process)

P16L12ff Did the authors measure 3H activities in their samples? This might provide some more information of the presence of young waters (i.e. younger than 60 years).

Tables

C3

Table 1

Units are missing. You cannot report a value without its unit. Also use μmol (not umol ; Fe and NH_4^+). On what is the s.d. ($\pm x$) values based? Please include a brief description to the Table caption. Also mention in Table captions full names of HTL and HTU.

Table 2

Units are missing ($\%$ vs V-PDB and pMC) from the first line. See my comments for Table 1 and also my comment on reporting a value with a rather large uncertainty (P13L2). It simply makes no sense to report a value of (65.16 ± 4.03) => change to (65 ± 4) or (65.2 ± 4.0) .

Table 4

See my comments in units above. Provide a citation for Tamers and F&G or at least mention in the Table captions that these are explained in the review by Han and Plummer.

Figures

Figs. 2, 3, 6 and 7:

Data points are hard to distinguish if the plot close or over each other. I suggest using a thin black line for the circles. In Fig 7 reduce symbol size and use open circles instead of filled black to improve readability.

Fig 6b and 6c

- What is the unit of DIC on x-axis?

- Figure caption of 6b is wrong: The caption states that ^{14}C is plotted vs $1/\text{DIC}$ but y-axis is labeled $\delta^{13}\text{C}$.

- Figure caption of 6c is wrong: The caption states that $\delta^{13}\text{C}$ is plotted vs $1/\text{DIC}$ but

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y-axis is labeled pmC. Note that $\delta^{13}\text{C}$ is not a concentration.

Technical comments

P5L10 check parentheses (H1 (upslope

P6L2 table 1 => Table 1?

P7L18 space character (0 pMC)

P15L29 vales => values

P18L13 semicolon?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-534, 2016.