

## ***Interactive comment on “Hydrological connectivity as indicated by transport of diatoms through the riparian–stream system” by N. Martínez-Carreras et al.***

**Anonymous Referee #2**

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General comment This paper focuses on the analysis of stream-riparian-hillslope hydrological connectivity in a humid catchment investigated through the use of the novel tracing technique provided by diatoms. The well-known Luxembourg-based research group was the first, as far as I know, to promote this experimental method a few years ago and this is one of the first applications to investigate hydrological processes at the catchment scale. Overall, the paper is clearly written, with a clear goal, sound analysis and interpretation, and good graphs. However, there are some points that I think the author should address and explain better. First of all, I agree with all comments by the first reviewer, and I'm avoiding to repeat them in my review. I encourage the au-

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thors to pay particular attention to the comments reported at the top of page C762 (the comments regarding P2403, L4-9 and P2404, L11-12) and in the central-lower part of page C762 (the comment regarding P2406, L2). In addition, I have also some major concerns and some minor corrections that are reported below and that, in my opinion, should be considered before acceptance of publication to HESS.

Specific comments -The title does not reflect very well the three objectives: indeed, the title suggest a more process-based study, whereas the objectives are more methodologically-oriented. Maybe the title could be changed into “Diatoms as indicator of hydrological connectivity through the riparian-stream system” or something like that.

-I like the fact that the three objective reflect well three subsections of the Discussion. However, when one reads the paper for the first time, he/she has a hard time to see the differences between the first objective and the third one. The authors should probably reformulate these two questions in a more univocal way.

-P2402, L1-7. These findings are not clearly showed in the manuscript and it's not clear if they come from previous research (in this case insert references). This behaviour should be showed by a new Figure or including a reference to an existing Figure. More importantly, I think that the observation that a second peak (mostly formed by pre-event water, as stated at P2410, L21) does not occur during dry conditions suggests that groundwater (which I assume is the most important component of pre-event water) levels are low and not contribute much to the hydrological response. But this would imply a small contribution of pre-event water, which is not the case (event water dominates during wet conditions). However, later in the manuscript, it's reported that when the catchment was wet there was a higher contribution of groundwater to stream-flow. This is quite confusing, we need evidence of these observations, and I think that the author should do a better job to clearly show measurements and observations here and to discuss more in details in section 5 the process interpretation based on them. Finally, we have no clues of how large or small runoff coefficients are: they that should be reported in a Table somewhere (possible Table 4).

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-P2404, L14-15. Higher contribution of throughfall compared to what? Compared to throughfall when the catchment was dry? Or compared to groundwater? Please, clarify, this is an important part to understand well how the catchment behaves.

-P2405, L19. I know very little about diatoms but I guess we can expect no valves in rainfall samples. Is it the same for groundwater? Would it be possible that rainfall infiltration processes during long or intense events facilitate percolation of diatom valves through the vadose zone and down to shallow groundwater? Please, add a few words on this here.

-P2406, L28. Are the bivariate plots built putting streamflow on the x or y axis? This has to be mentioned to correctly understand the direction of hysteretic loops.

-P2409, L28. This is a critical point. The authors say that transport of diatoms from the riparian zone to the stream could occur via macropores in the shallow subsurface layers and/or overland in the riparian zone. In principle, I agree with the explanation. However, the authors found very little diatoms in overland flow (P2406, L2) and this seems to be in contrast with their second hypothesis of stream-riparian diatom transport. Moreover, PCA suggests only a minor role of overland flow for streamflow generation (P2404, L8-11). I think that some suggestions should be posed by the authors on this issue.

Minor comments and technical corrections P2392, L11. Here and later in the manuscript: 'assemblages': is this a technical word used to describe biotic communities?

P2392, L25-28. These sentences should be modified according to possible changes in the results and discussion about the source of diatoms (role of hillslopes).

P2393, L11. Add 'of water' after 'stable isotope'.

P2398, L5-7. Skip this, it have already been mentioned.

P2399, L21. Here, and everywhere in the manuscript, I strongly suggest to avoid using the term 'concentration' when referring to the isotopic signature. Technically, it's not a

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concentration. I suggest to use 'isotopic composition'.

P2399, L26. Include 'isotopic' between 'bulk' and 'composition'

P2400, L2. Skip 'end-member mixing analysis' and use directly EMMA. The acronym has been already defined at page 2394.

P2400, L2. Add 'that' after 'assumes'.

P2400, L10. It's good that you have included reference but please shortly explain what is the difference between 'physical mixing' and 'equilibrium mixing' because this is an important concept here.

P2400, L21. Explicit 'SD' (I guess standard deviation).

P2401, L1. 'was' should be 'were'.

P2403, L13. What is 'riparian water'? Groundwater? Overland flow? Please, clarify.

P2403, L16. Since here several solutes were mentioned, it's not clear to which of them the correlation refers to. Please, clarify.

P2403, L17. It's not clear what the authors mean by 'retained for further analysis'. Which? Why? Please, explain.

P2403, L19. What is the 'pre-defined threshold of collinearity'? Pre-defined by whom? Please, clarify and possible include a reference.

P2403, L21. Skip the definition and use only 'PCA' (acronym already defined earlier in the manuscript).

P2404, L24. Change 'wettest' into 'wet'.

P2405, L7. Is 230 a small or a high or a usual number of taxa? We, as simple hydrologists, have no solid idea.

P2405, L7. I suggest to delete 'catchment-wide'.

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P2405, L12. Replace 'Riparian' with 'riparian'.

P2406, L4. Replace 'But' with 'However'.

P2407, L15. 'Fig. 10b' should be '9b'.

P2407, L25. Although everybody knows what DOC is please explicit the acronym. Moreover, explain and/or give a reference supporting the statement that UV absorbance can be considered a proxy of DOC (it's not immediately intuitive to me).

P2408, L7. Skip 'hillslope-riparian-stream' and use directly HRS, since it was already defined.

P2408, L10-11. Remove (already mentioned).

P2408, L22. Typo in 'litter'.

P2410, L9. Use only 'EMMA', without the already mentioned definition.

P2411, L14-19. This sentence sounds as already said. Please, try to reformulate.

P2411, L26. Remove 'But'.

P2412, L4. I think it's more common to use 'ecohydrology' or 'eco-hydrology' instead of 'hydro-ecology'.

P2413, L10. Replace 'hillslope-riparian-stream' with 'HRS'.

Table 2. In the caption, I suggest to remove the sentence in brackets (but keeping the sample size).

Table 3. I suggest to specify in the caption that the valves found on the hillslopes do not include the dry litter zone. Moreover what is the 'baseflow drift'?

Table 4. Replace 'storm runoff-events' with 'rainfall-runoff events'.

Fig. 2. In the second panel, use the same label used in Fig. 3, for consistency. I suggest to move the discharge series in the upper panel. I also suggest to change the

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caption in 'Time series of precipitation, discharge, groundwater depth, volumetric water content ...'. Also mention what the numbers indicate.

Fig. 4. Change the label 'O-18' into 'd18O' or at least '18O'. Change 'winter' response into 'fall-winter' response. Change 'Two components' into 'Two-component'. Delete all that comes after 'using d18O'.

Fig. 5. As mentioned above, indicate what 'riparian water' means. Moreover, add if the median or the mean is displayed in the box-plots, as well as percentiles/standard deviation etc..

Fig. 6. The part in brackets can be deleted (but keeping the overall sample size). Add 'The' Before 'upper'.

Fig. 7. Where is the vertical error bar in panel b? Too small to be displayed? SS3R is not in the legend and it's not clear what it indicates. Moreover, how can it be an end-member if some samples (e.g., event 2) fall outside it?

Fig. 8. Would it be better to split the Figure in two? Moreover, change '%' into 'percentage'. The last 9 words could be deleted.

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