

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2  
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## **Comment on hess-2021-267**

Anonymous Referee #2

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Referee comment on "Identification of the contributing area to river discharge during low-flow periods" by Maxime Gillet et al., Hydrol. Earth Syst. Sci. Discuss.,  
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This study estimates the contribution of several groundwater reservoirs, differentiated by geological characteristics, to the low-flow period of a Mediterranean catchment. The authors used various methods to decide on the end-members in an EMMA, and considered correlations between tracers and their variability. I appreciate this thorough analysis and relatively objective decision on end-members, and the work the authors put in here. Additionally, the uncertainty analysis was well performed by using different end-member definitions.

However, I must admit I stopped reading the manuscript shortly before the Discussion sections. The manuscript is overflowing with English mistakes, mistakes in units, inconsistencies, strange sentences, etc. It is very difficult to follow and URGENTLY needs a native speaker to polish it up. It borders on unreadable, and it takes too much concentration while reading. Sometimes I was not even sure if I understood a sentence correctly and I had to read it five times; this must not be the case in a scientific publication.

Besides this major point, the results section sometimes includes discussion sections...either the authors separate these more clearly, or they combine results and discussions. I have no preference here.

Following is a list of inconsistencies and questions I had up to approximately the Discussion section. I hope that in a future version of this manuscript, the readability is strongly increased.

Title: no caps lock, and change "period" to "periods"

L2: change "trial" to "evaluate"

L5: delete "the" before "trajectory"

L16: delete the comma before "and quality" and put it behind "quality"

L18-19: the sentence closes in on itself: "investigating processes that sustain streamflow are required to understand processes that maintain low-flows" (with sustain and maintain, and streamflow and low-flow having basically the same meaning). The sentence says "investigating A is necessary to understand A", which is logical and does not need to be mentioned.

L27: "maintaining base flow" ... also only in mountain areas? Also, in this line "base flow" changes to "baseflow". Decide on one spelling.

L30: delete first "geological"

L32: the aim of which study? (of course yours, but needs to be mentioned, especially after discussing a lot of other studies before)

L42-44: unclear sentence. What is the main interest of EMMA? What are model output probabilities?

L45-48: what is made possible by differentiating water by season, etc.? The combination of hydrometric data and hydrogeochemical data, of the previous sentence? Or does the EMMA method make differentiating water by season possible?

L50: which assumptions, of which tools? Unclear.

L58: which water table? Groundwater? Why is it limited? Is it artesian groundwater?

L60: "this paper search"?? applicability of which methods?

L62: "productivity" is a strange word for runoff-generation contribution here.

L72: why does focusing on low-flows allow the increase of the sampling rate? Also when sampling the whole hydrograph, the sampling rate can be increased, e.g., with automatic samplers.

L73-77: delete. This is just a summary of the basic layout of every research paper, and therefor unnecessary.

L88: Figure 1 1? Figure 1 I (L)?

L91: 1,110 mm. Adapt everywhere and avoid the space between digits.

L93: 50 mm in which months exactly? Jul-Sep? And autumn from Oct to Dec?

L94: modulus = ? also mean monthly annual discharge without capital letters, and the term is very confusing. Is this the monthly or annual discharge? Is this the mean minimum discharge of all months for all years?

L98: "mica schists 1"? what is the meaning of the "1"?

L105: "and suitable to trial our approach carry out our research" English needs correction

L111: I would either choose l/s or m<sup>3</sup>/s to make it easily comparable with line 94.

L117-118: The first sentence says that rainfall has a low impact on runoff, while the next sentence starts with the information that runoff variations are due to rainfall events.

L128: call hydrogen potential by the more commonly known pH. Like in L130, but not PH but pH.

L132: collected in tubes? Not in sample bottles? If tubes, how were the closed?

L137: which reservoirs? It is unclear how the sub-catchments were chosen, since what is meant with reservoir is not clear and Table 1 is not helpful in this regard.

L147: what is the difference of river and surface water? Tributaries? Lakes? And what was the sampling frequency for surface waters?

L148: does the 4 in brackets mean that four sections were sampled? Why not directly write this then?

L149: what is a "large panel of groundwater"? Also, why does the sampling campaign in 2019 last until December when in line 145 it stops in October? Is this a different sampling campaign and "completed" in Line 148 should be "complemented"?

L151: the wastewater treatment plant was not mentioned in the study description where "minimal anthropogenic influence" was discussed, only tourism and a cheese factory. It must be mentioned there, especially if samples were taken from it...for which I assume it can not simply be ignored.

L154: the description of the additional sampling campaign does not make sense. Five sites were monitored with six tributaries, with 3 per site.  $3 \times 5 = 15$ , and not 6. Or is it "side", as in left and right side of the river? That would explain the 6, but why then five locations?

L156: description of the salt tracer method applied to the tributaries needs to be rephrased, as it is almost incomprehensible. At least I assume the salt tracer method was used, since dilution gauging was mentioned, but then a current meter is used which is a sensor that measures the flow of water and not electrical conductivity...which was used in the main river and not the tributaries where actually dilution gauging was applied (?)...this section is like many before very, very confusing.

L182: use "18.2 M $\Omega$ " instead of "18.2 M". "Rock water" should just be "rock", since it's the mixture of rock powder with the ultrapure type 1 water?

L187: delete "presented in 2.2"

L208: the name of GLUE is wrong, it's likelihood and not probability. The explanation of GLUE in the next two sentences is lacking.

L214: the uncertainty is associated with 5% of the devices used to analyze the data? The sentence seems to say this. And how is the uncertainty due to the chosen tracer in any way related to the measurement precision? This is measurement uncertainty and not the model conceptualization uncertainty.

L214-215: "A temporal variation treats uncertainties associated with the choice of geochemical poles." I have no idea what this means. Temporal variation of what? Treats uncertainties?

L215: linking measurement uncertainty to the variation in the tracer signal makes absolutely no sense. Of course the tracer signal will vary in time, otherwise it's not a good tracer. The measurement uncertainty must be linked to the uncertainty of the measurement device, or sampling uncertainty due to spatial heterogeneity.

L224: the digits in brackets behind each method that follows are unnecessary

L229: why does the seasonal mean (2), which considers seasonal mean values, then use annual mean values?

L254: mark the discussed end-members also clearly in Figure 4.

L256: "3 groundwater"???

L258: correct unit is  $\mu\text{S}/\text{cm}$ , not  $\mu\text{s}/\text{cm}$  which looks like seconds.

L260: correct to assume the authors mean MEGAequivalent per liter with  $\text{MEQ}/\text{l}$  ( $10^6$ ), instead of milliequivalents per liter  $\text{mEq}/\text{l}$  ( $10^{-3}$ )?

L264: the sulphate contents remain low for other elements?

L265: specify the schist alterations at least in the Discussion if not here directly

L277: it was not mentioned in the site description that black mica schist is directly under the limestone plateau. In which depth does the limestone end and black mica schist start?

L279: it is mentioned that Figure 5 shows a seasonal evolution of ion concentrations, but Figure 5 has no temporal information, at least not clearly discernible.

L287: "lixiviation" -> "leaching"

L322: There are more than one outlier visible in Figure 8, I count at least 3, e.g. borehole cluster 1 in black mica schist, two cluster three elements in black mica schist.

L346-347: identical measurements of dissolved oxygen in springs and surface water to those of streams and springs? Two times surface water/stream and springs are compared, of course they are the same.

L361: contribution of -10%?

Figure 1: in the caption "a water mine is a horizontal well dug a slope"??? what does this mean? Why is the station PR marked in the figure and not also the main outlet?

Figure 2 does not seem to transport important information that is not also described in the text and could be deleted.

Figure 4: the legend is too small.

Figure 5:  $\mu\text{S}/\text{cm}$  is written as  $\text{uS}/\text{cm}$ . Are all axis logarithmic? Must be mentioned somewhere.

Figure 9: change colors from black mica schist and limestone, they are very difficult to differentiate

Figure 10: misses information which panel is which year

Table 1: more confusing than helpful. Is it important if collection was outsourced?  
Outsourced to whom? Can be deleted in my opinion. What do the numbers in the rows  
"Sampling in 2018" and "Sampling in 2019" mean? What does bold mean? The text is not  
helpful due to the lack in English.

Table 3: the caption mentions red values, there are no red values