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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A major waterfall landscape maintained by fog drip water" *by* Lucheng Zhan et al.

Anonymous Referee #1

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Review for "A major waterfall landscape maintained by fog drip water" by Lucheng Zhan et al. Submitted to HESS

The manuscript by Zhan et al. investigates the influence of fog water on the streamflow of streams and water falls in the Chishui River Basin, in particular during the dry season. The investigation relies on the analysis of the isotopic composition of fog, stream, and rain water to calculate the proportional contribution of fog water input to the streamflow.

While the isotope analysis is very thorough and that I think the investigation might be an interesting addition to the literature showing the importance of fog water contribution to the water cycle, I think that a few key aspects of the analysis are presented without any data backing them up, making some of the arguments purely qualitative. As is, I

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would not recommend this manuscript for publication in HESS.

Here, I list the main issues that I have found with the study:

1) Data on the amount and the timing of the fog events is clearly lacking in this study. Currently, fog events are described as happening “often” or “most days”. However, in a place with such a strong seasonality in rainfall, one would also expect a seasonality in the fog formation. In particular, data on which days and for how long fog forms can be easily recorded using a simple camera and basic image analysis. I think this information is vital to get a full picture of the hydrology of the site, and this new information could potentially completely change the conclusion.

2) The geology of the area is invoked throughout the manuscript to explain the type of vegetation present, the occurrence of fog, and the large number of springs and waterfalls. However, no data is provided about the permeability of the different rock formations and details about the underlying soil and rock layers come from general geological information, as opposed to being new information provided by this study. As such, I think the geological argument should be shortened and condensed within the discussion section.

3) Organizational issues: I would suggest separating the results and discussion sections. As it is, it is currently very hard to understand how the different arguments work together towards the conclusion. I also think that the subsections in Section 3 could benefit from being further subdivided into subsubsections, making each piece of the argumentation clear. Finally, I am really confused as to why the figures are presented in an order that does not match their order of appearance in the text.

4) The English language needs to be improved. In the following, I do my best to correct small mistakes and point out sentences that need to be reworked.

Technical issues:

Abstract:

- L19 and L20: “fog”, not “fogs”

Introduction:

- L29: dry conditions

- L42: “seasons and thus the. . .” change to “seasons, resulting in the. . .”

- L46: may significantly affect

- L48-49: Rephrase the sentence starting with “With more even. . .”

- L49: has long been assumed to be

- L52 to 55: rephrase the sentence starting with “The contribution of the. . .”

- L63: measurements, which are

- L64 contributions from fog and rain

- L69: total water input, and was subject

- L89: Maybe replace the beginning of the sentence by: “A question remains as to whether or not fog can. . .”

- L91: the surrounding area

- L92: also be significantly affected

- L93: the link between fog water and the forest’s unique

- L94: the link [. . .] underlying hydrological processes is not well understood and requires further

- L96-97: rephrase the sentence starting with “It is unclear. . .”

- L101: remove “Using the methods of isotope hydrology”

Section 2: Materials and Methods

- L116-132: Remove. See my comment above: the argument based on the geology of the area should be condensed and moved to the discussion.

- L140: It is 80m high

- L141: 76.2m wide

- L142: during the rainy season

- L153: remove “affected by this drought event

- L153: the total rainfall from January

- L154: Name and exact geolocation of the met station??

- L154-155: which was the lowest record for that period between 1981 and 2015.

- L155: During fieldwork, we observed

- L156: quantify “obvious”

- L156: replace “water shortage in stream flow” by “a decrease in stream flow”

- L160: showing little impact of the drought

- L161: add details on the brand and the cap/septa type

- L168: A second, more detailed

- L170: streams, waterfalls, and rivers

- L174: during fieldwork

- L176: rephrase or remove “very moist” and “easily seen”

- L178: what do you mean by the “scale” of a waterfall? Do you mean its size?

- L179: sandstone cliffs

- L190: what’s an “open site”? Do you mean with full view of the sky (and not under the

canopy?)

- L198-211: You need to give more details about the actual analysis: number of standard used and in which position, post-processing, etc. . . Also, please explicitly describe the brand, name, and isotope value of the standards used.

- L201: in-line

- L202: this technique involves

- L203: the product gases are separated

- L210: 2permil for 2H on a mass spec is really high. Can you comment on why this value is so high?

- L212: Is the LMWL built from the rainfall data you collected and that is cited later on? Or is it from previous studies? Either way, please explain how your LMWL was built.

- L213-216: Please rephrase the sentence starting with: "Data for daily rainfall. . ."

- L219: What analysis of rainfall-runoff are you referring to?

Section 3: Results and discussion

Estimates of the error in your measurements is missing throughout this entire section.

- L228: isotopic composition

- Section 3.1: this entire subsection is based on the qualitative analysis of Figure 3. A lot of the conclusions derived are based on two or three data points. Overall, I think that figure 3 and Section 3.1 end up undermining the analysis. Either quantify the "dramatic changes" (L238, L244) or simply remove the figure and section, since I think the following sections/figures are a lot more convincing.

- L254: isotopic composition

- L273: Maybe Kaseke et al (2017) could be a good, more recent reference to

add to this list Kaseke, K. F., Wang, L., & Seely, M. K. (2017). Nonrainfall water origins and formation mechanisms. Science Advances, 3(3), e1603131–. http://doi.org/10.1126/sciadv.1603131

- L286: How about evaporation effects once the water deposits on the leaf?

- L312: Here would be a good place to have a subsubsection

- L314: "water sourced from precipitation": what water? Soil water, stream water? Please rephrase.

- L323: average rate?

- L326-329: Please rephrase the sentence starting with "the isotopic values of the river. . ."

- L330-335: Remove, not useful

Section 3.3: here again, there is a real need to provide a more rigorous quantification of the various arguments presented.

- L352: during the dry season

- L353: quantify the variation in stable isotope composition during the dry season

- L353-354: the isotopic composition of the streams in December was similar to that of . . . the isotopic composition of the baseflow.

- L357: Here, I am not convinced that what is seen in Figure 6 is really a lag in the isotopic composition of stream compared to rain water. In particular, the lack of stream data until May makes it difficult to properly compared both time series. In addition, the difference in sampling time between the rain and the stream water analysis means that you might be missing details in the variation of rain water composition, especially during the rainy summer months.

- L363: decreasing trend

- L370: infiltrates and recovers soil saturation

- L373: what do you mean by “as the groundwater level”?

- L376: quantify “high permeability

- L377: easy, not easier

- L377: in montane catchments

- L385: How about the effect of soil water evaporation, which would have a similar effect of enriching rainwater before it enters streams?

- L406-445: Here is where additional information on fog events would be really helpful to solidify the argument.

- L417: Potential break for a subsubsection

- L428: vary seasonally: data?

- L431: an underestimation of the overall fog

- L443: a subtropical humid climate

Section 3.5: here is where you could condense all the geological information + include more specific information regarding the different rock formations, in particular permeability.

- L476: “most days of the year”: please show data on fog formation timing!

- L476-478: remove

- L481: into soil together

- L483: intense rainfall. However, most rainwater infiltrates

- L485: fog water is persistent: is it? Again, having fog formation data is crucial to this argument.

Figure 3: See my comment above, I do not think that this figure helps the analysis and it should be removed or moved to the supplemental information

Figure 4: this is a great summary figure of the isotope data

Figure 6: Describe the figure from top to bottom, starting with the rainfall data. Explicitly mention “top”, “center”, and “bottom”. Why is the stream data before May not available?

Table 1: it would probably be enough to simply give the average and the STE, and not the range. Add one extra column for the number of samples.

Figure S1: sampling campaign was conducted from.... Rainfall data from the China Meteorological...

Figure S3: the digital elevation data for Figures S3 to S7, not S2 to S6.

Figure S7: Are the differences in wind direction between the 4 maps actually significant?

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