Reply to:

Interactive comment on "Rosalia: An experimental research site to study hydrological processes in a forest catchment" by Josef Fürst et al.

Anonymous Referee #1, Report #2
Submitted: 26 May 2021

Josef Fürst (on behalf of the co-authors) June 28, 2021
Replies are formatted in blue, while the original referee's text is in black. Line numbers in blue refer to the revised manuscript.

Dear anonymous reviewer,
thank you for your second thorough review and your additional efforts to improve our article. We have gratefully adopted the suggestions and made changes to the article. The changes are documented below:

Although the article has clearly improved I still found that sometimes the text was longer than it needed to be. One reason for that could be that some topics (e.g., rain gauges and rainfall sampling) are discussed in different paragraphs. Hence, the reader had to be reminded of the rain gauge set-up to make the paragraph understandable. Re-structuring the article a bit more such that all relevant information is mentioned together will further reduce the length of the article and improve its readability. It will also reduce questions such as "how is precipitation sampling protected against fractionation" that arose as I first read about the rain gauges.

We want to clearly distinguish between precipitation measurement and water quality monitoring. Therefore, the sentence on the Palmex totalisators was moved to section "water quality".

We added the information to the totalisators that they were specifically designed to protect against isotope fractionation.

Minor comments:

L35: CZO, update with more recent CZN

R: added "… and has been succeeded as the Critical Zone Collaboration Network (CZN) since 2021."

L56: giving examples of these questions would be more meaningful

R: there are 23 unsolved problems listed in the reference. In our opinion, the relevant questions for this article are sufficiently summarized in the following sentences on L56-59.

Fig.1: Why are climate stations (K1 and K2) and soil moisture stations located at the same elevation, rather than covering a range in elevation?

R: This comment is not clear: K1 is at 640 m a.s.l. and K2 at 385 m a.s.l. Soil moisture station Q1S0 is next to Q1 at 560 m a.s.l. Soil moisture stations Q2S0 to Q2S2 are next to Q2 and form a slope transect with heights from 558 to 572 m a.s.l. as can be read in table 1 and Fig 1. *(no changes in the manuscript)*

L77: examples of these parameters?

R: added "(e.g., hydraulic conductivity and porosity of soils, soil water movement),"

L105: "water holding capacity" rather than wind capacity? And please be specific about how wind and slope affect organic content. "wind" doesn't do much to organic content, but wind erosion might. Slope doesn't do much to the organic content, either, but gravitational transport does.

R: improved the sentence: “These sites are characterised by poor water holding capacity and loss of organic material due to gravitational transport and wind erosion.”

L109 onwards: maybe a more descriptive name than category 2 is possible, and would make it easier for the reader to follow.

R: The names of the soil categories are given at the beginning of the sentences (“Cambisols at plains and moderate slopes”). The single digit category numbers are kept to maintain a consistent link between labels in the map and the legend in Fig. 3.

Fig. 3: use other numbers to indicate category’s – currently confusing with percentages.

R: changed the style of the piechart labels to “1: 5%”, etc.

L142: spectrometer probe, mention brand or refer to table

R: added S::can multi::lyser™

Table 2: not sure if the websites here are needed…

R: a previous reviewer wanted more details on sensors

L169: (how) are the autosamplers equipped to avoid fractionation?

R: The focus of this paragraph lies on the data collection system, which operates automatically and allows remote access to the data. We only mention the isotope measurements here, as contrary to the rest of the data, their data is not automatically imported into a database, nor is it remotely accessible. Describing the stable isotope measurement systems and their respective protection measures against evaporation in detail would thus not fit into the context. This information is presented later in the manuscript when describing the specific measurements.

L203: maybe include the ‘rules for proper placement’ or at least the rules that were violated (in addition to the one that is mentioned particularly.

R: The WMO guide to hydrological practice (WMO, 2008) describes appropriate rain gauge location on more than 2 pages. To keep the text short – as recommended – we rephrased to “Furthermore, it was not possible to place all rain gauges in the forest in such a way that no negative wind influences occur. Particularly, the recommendation that the height of nearby objects, such as trees, should not exceed the distance from the gauge to the objects (WMO, 2008), had to be disregarded for Q1 and Q2.”

L205: how are these rain gauges equipped to avoid fractionation?

R: To avoid confusion between rainfall measurement and sampling for isotope analysis, the reference to rainfall collectors has been moved to the water quality section. There, we added the information that the samplers are specifically designed to prevent isotope fractionation.

L217: refer to figure 1?

R: added reference to Fig. 1

L227: how are these samples protected from fractionation when left without maintenance for 24 days, particularly when freezing issues occur (L227-230).

L231: please explain more carefully. The grab sample was analyzed directly or kept in a closed bottle until the autosampler sample was analyzed (open for 24 days?). Please show these results here or in the supplementary material, or at least mention an r2 value or any other type of statistics.

R: We now describe the system in more detail and show that the average offset between grab sample and autosampler isotope values was close to the measurement uncertainty of stable isotope ratios.

Sections rain gauges and water quality: please merge these sections such that all relevant information is presented together. In the current version, the sites and type of rain gauge are repeated, and reading the initial rain gauge section raises questions about sampling is done.

R: We did not merge the sections but removed “rainfall sampling” from “rain gauges” to the water quality section to clearly distinguish these two different types of observation.

L267: was a time-window (smoothing window) applied for the linear interpolation? If so, please mention the time-window.

R: as all time series are recorded at a 10-min interval (see section 3.1), the spikes described here consist of one or two values only and therefore the time window for linear interpolation is either 20 or 30 minutes.

L269 and L273: please define ‘very low flow’

R: added “(water level less than 2 cm in the flume),”

L285: increased compared to what?

R: rephrased to “In the hydrographs for the period 2018 to 2019 (**Fehler! Verweisquelle konnte nicht gefunden werden.**) it can be seen that the base flow is greater in spring and early summer than in autumn and winter, and that sharp runoff peaks occur after rainfall events.”

L304: please merge with other paragraph describing this problem.

R: we feel that this short reference to the problem of rain gauge location is necessary here to introduce the discussion on the following lines.

L305: good agreement of what? The timing? Or the precipitation magnitude? Why would precipitation magnitude be similar at two different stations?

R: we rephrased to “However, the rainfall depths at all seven rain gauges are very similar for larger rainfall events that extend over the whole watershed.” In this small watershed of 222 ha only, only minor differences between rainfall depths for time intervals greater than a few hours are to be expected. The short time interval of 10 min allows the spatio-temporal development of a precipitation event to be recorded.

Reply to:

Interactive comment on "Rosalia: An experimental research site to study hydrological processes in a forest catchment" by Josef Fürst et al.

Anonymous Referee #2, Report #1
Submitted: 22 May 2021

Josef Fürst (on behalf of the co-authors) June 28, 2021
Replies are formatted in blue, while the original referee's text is in black. Line numbers in blue refer to the revised manuscript.

Dear anonymous reviewer,
thank you for your thorough review and your efforts to further improve our article. We have gratefully adopted the suggestions and made changes to the article. The changes are documented below:

Thank you for revising the manuscript. From my point of view, it has improved significantly. The description of the watershed, sites and sensors are more detailed and therefore better understandable. Also the added details about data description, accuracy and data cleaning process support the understanding for the readers and possible data users.

However, I still have a few minor comments.
With regard to the Revised Manuscript:
- Fig 1: Source for the DEM / elevation map is missing in the figure caption.

R: added source data.noe.gv.at

- Line 91: This coordinate LAT 47°42'N, LON 16°17'E refers to a single point. However, the corresponding sentence belongs to the watershed description. Either further coordinates would have to be added here to delineate the watershed or it would have to be added which point this is.

R: replaced by reference to Fig 1, which has an overview map showing Lat/Lon graticules.

- Line 92: "Terrain heights range from 320 to 725 m a.s.l.". Why does the map legend in Fig. 1 starts with 361 m asl? Is this due to the map resolution?

R: corrected. Thank you for this careful check! 320 is the lowest elevation of the whole educational forest, while 385 m is the lowest elevation of the watershed.

- Lines 93-94: On what source is this precipitation and temperature data based?

R: added the open data source available via LTER and adjusted the time span.

- Fig. 3: Source for the map is missing in the figure caption.

R: the map has been created for this manuscript, no citeable source.

- Fig. 7: It is pointed out in the figure caption that the highest peaks have been cut off. Nevertheless, it might be interesting for the reader to know when the highest peaks appeared. Would it perhaps make sense to use arrows to mark the positions? Or you can refer to the repository.

R: the full range of the discharges is visible in Fig. 6. The detail in Fig. 7 focuses on the diurnal fluctuations.

- Line 349: Please add a reference of the DEM to the reference list.

R: added

- Line 467: Add that it is a diploma thesis comparable to line 508.
- Line 522: Add that it is a PhD thesis comparable to line 508.

R: consistently added

With regard to the Repository:
In the modified manuscript there are confusions regarding the repository.
In the modified version now there is a new link to https://doi.org/10.5281/zenodo.3997140.
Checking the README.txt file, it states that “This is the repository ‘Rosalia: an experimental research site to study hydrological processes in a forest catchment - data repository’, available at https://doi.org/10.5281/zenodo.3997141 (Fürst et al., 2020)”. This is not consistent because it refers to the old link of the first submitted version.

R: the DOI concept of Zenodo may be a bit confusing, because the last digit is used for versioning. The link https://doi.org/10.5281/zenodo.3997140 is the stable one, because it automatically refers to the newest version. This is preferred, because we intend to update the repository annually. We updated the README.txt file accordingly.

It also includes the still unchanged title of the manuscript.
Additionally, within the file “Rosalia ESSD.html” under 9 GIS datasets the “Map of sites - Detail Q2” contains elements in the legend which are not part of the map.

R: changed and updated in the repository