Editor decision: Publish subject to minor revisions (review by editor)

by Gabriel Rau

Public justification (visible to the public if the article is accepted and published): Two reviewers consider the manuscript timely and relevant, presenting an integrative approach to mapping river intermittency using UAV data, Random Forest modelling, and remote sensing predictors. The study addresses an important knowledge gap and is of interest to Hydrology and Earth System Sciences readers. The authors have responded to earlier reviews and introduced useful revisions, including a section on study limitations.

We thank the editor for the positive evaluation of our manuscript and for the opportunity to further improve it. We have carefully addressed all issues raised by the editor and reviewers, and the corresponding revisions are detailed point by point below.

However, one reviewer recommends further improvements prior to publication. Key points include strengthening engagement with the broader literature on non-perennial rivers, clarifying methodological choices and associated uncertainties (e.g. ground truthing, predictor selection, representativeness), and refining terminology. The reviewer also notes the need for clearer treatment of precipitation seasonality, human modifications such as small dams, and several presentation issues, including missing references, unclear variable definitions, figure inconsistencies, and minor language and formatting corrections.

We appreciate the reviewer's constructive suggestions to further strengthen the manuscript. All points raised have been carefully addressed in the revised version and are discussed in detail in our point-by-point responses to the reviewer below, with corresponding changes clearly indicated in the manuscript.

One concern is that groundwater–river connectivity is largely neglected in the manuscript, with the term "groundwater" mentioned only once. This omission is notable, as groundwater is well known to buffer river flow and exert a strong control on flow intermittency, particularly following flow events when infiltration elevates the water table above the streambed. In general, groundwater levels tend to converge toward the river channel in downstream reaches, a behaviour that is also evident in the modelled results shown in Figure B1. While I recognise that the present study examines streamflow intermittency primarily through a remote-sensing perspective, the manuscript would benefit from the inclusion of at least one paragraph acknowledging the role of groundwater, supported by key references, and identifying groundwater–surface water connectivity as an important consideration for future work. The lack of consideration of groundwater should also be mentioned as a limitation in the Conclusions.

We thank the reviewer for this important and well-taken comment. We agree that groundwater–surface water connectivity plays a key role in controlling flow intermittency in non-perennial rivers and that this process was insufficiently

acknowledged in the original version of the manuscript. While the present study adopts a primarily remote-sensing and data-driven perspective and does not explicitly incorporate groundwater observations, we recognise that subsurface processes likely underpin part of the spatial patterns captured by the model, particularly along downstream reaches, as noted by the editor.

To address this concern, we have added a dedicated paragraph in the discussion in Section 4.2 explicitly acknowledging the role of groundwater in streamflow intermittency and discussing how groundwater dynamics may influence water occurrence patterns. In addition, we now explicitly identify the lack of groundwater data as a limitation in the Conclusions and outline the integration of groundwater observations and groundwater–surface water connectivity as an important direction for future research. Relevant references have been added to support this discussion.

4.2 Identification of important predictors

Lines 390-400:

"We also acknowledge that other important attributes may have been omitted from our analysis. For example, we did not consider the role of groundwater in river intermittency, despite it being a well-established control on water presence along the riverbed (Conant Jr et al., 2019). In many catchments, groundwater levels tend to converge toward the river channel in downstream reaches, contributing to spatial gradients in intermittency that may not be directly observable from surface-based remote sensing alone (Sophocleous, 2002). In our study area, detailed investigations at a small scale (12 km²) have shown that runoff is mainly governed by precipitation, with negligible baseflow due to the short and highly concentrated events (De Figueiredo et al., 2016). In contrast, analysis conducted at a broader scale (20,000 km²) have shown different roles of groundwater on streamflow depending on the period of hydrological season (Costa et al., 2013). However, groundwater-level observations, hydrogeological information, and coupled surface–subsurface modelling outputs were not available for our study. Future work would therefore benefit from integrating such data to better disentangle the respective roles of climatic forcing, catchment properties, and groundwater storage in shaping non-perennial river behaviour."

5 Conclusions

Lines 571-575:

"A key limitation of this study is the lack of explicit consideration of groundwater–surface water connectivity, which is known to exert a strong control on river intermittency, particularly during recession periods following flow events. Although the remote-sensing-based framework successfully captures spatial patterns of intermittency, incorporating groundwater observations or hydrogeological information would improve process understanding and help refine

predictions of flow persistence in non-perennial rivers. Addressing this limitation represents an important direction for future research."

I also have a few minor details that should be addressed:

Figure 9: X-axis label change "River length since the source of the river ..." -> "River length from source (km)". Same for Figures A1 to A3.

Thank you for noting this. We have revised the x-axis label to "River length from source (km)" in Figure 9 and in Figures A1–A3.

Figure 10 needs an x-axis label, at least stating the year.

Thank you for pointing this out. We have added an x-axis label indicating the year in Figure 10.

Figure 11 needs some description that allows orientation, e.g., an arrow and word saying "Flow direction". Same for Figure B1 and B2.

Thank you for this suggestion. We have added a graphical indicator of flow orientation (arrow labeled "Flow direction") directly within Figure 11 and Figures B1 and B2. The figure captions were also updated accordingly to improve clarity.

In Abstract: Overall, the second last sentence attempts to recommend Sentinel MNDWI as the best model. Please could you strengthen the recommendation alongside some caveats so that readers can take this away confidently. The last sentence is very generic and should be further specified in regards to the findings and in relation to literature.

We thank the reviewer for this insightful comment. In response, we have revised the Abstract to strengthen the recommendation of Sentinel MNDWI while clearly including caveats regarding its applicability. The last sentence has also been made more specific by summarising key findings of our study and placing them in the context of previous literature:

> **Original:** *"The findings presented here emphasize the possibility of using this index even in narrow temporary rivers. The results provide insight into the hydrological diversity of semi-arid rivers and are therefore important to understand their role in water availability."*
>
> **Lines 18-23:**
> **Revised:** *"The findings presented here emphasize the possibility of using this index even in narrow non-perennial rivers, although its performance may vary depending on local hydrological and environmental conditions. The modelling framework developed in this study contributes to a broader understanding of flow intermittency as a spatially complex and highly dynamic process*

over time. The integration of high-resolution predictors demonstrates a scalable and adaptable approach for mapping wetness conditions in dryland rivers using landscape attributes, dam presence, and satellite indices as predictors."

Line 1: Please specify what you mean by "global changes" as this is too generic.

Thank you for this comment. We have revised the wording in Line 1 to explicitly specify the types of global changes being referred to climate change along with changes in land use and occupation, thereby improving clarity

Line 2: what do you mean by "temporary rivers"? Do you mean "temporary flow"? This also needs changing in line 18.

Thank you for this comment. To improve clarity and consistency with the literature, we have replaced the term "temporary rivers" with "non-perennial rivers" in Line 2, Line 18, and throughout the manuscript.

Line 2: Revise to "water scarcity" to make this clear

Thank you for this suggestion. We have revised the phrase to "water scarcity" in Line 2 to improve clarity.

Line 12: Revise "mimicked" to "described"
Line 15: Revise to "flow intermittency"
Line 18: Remove commas around "therefore"

Thank you for these suggestions. The text has been revised accordingly, including changing "mimicked" to "described" (Line 12), updating to "flow intermittency" (Line 15), and removing the commas around "therefore" (Line 18).

Please revise and prepare a detailed response as usual. I will then evaluate your revisions and accept the manuscript if satisfactory.

We thank the editor once again for their constructive and detailed feedback, which has helped us substantially improve the clarity, rigor, and scope of the manuscript. Revisions have been clearly indicated in the manuscript, and we believe that the changes have strengthened the study and enhanced its value for readers. We hope the revised manuscript now meets the standards for publication in Hydrology and Earth System Sciences.

REFERENCES

Conant Jr, B., Robinson, C. E., Hinton, M. J., and Russell, H. A.: A framework for conceptualizing groundwater-surface water interactions and identifying potential impacts on water quality, water quantity, and ecosystems, Journal of Hydrology, 574, 609–627, 2019

Costa, A. C., Foerster, S., de Araújo, J. C., and Bronstert, A.: Analysis of channel transmission losses in a dryland river reach in north-eastern Brazil using streamflow series, groundwater level series and multi-temporal satellite data, Hydrological Processes, 27, 1046–1060, 2013.

De Figueiredo, J. V., de Araújo, J. C., Medeiros, P. H. A., and Costa, A. C.: Runoff initiation in a preserved semiarid Caatinga small watershed, Northeastern Brazil, Hydrological Processes, 30, 2390–2400, 2016.

Sophocleous, M.: Interactions between groundwater and surface water: the state of the science, Hydrogeology journal, 10, 52–67, 2002.

Comments to Anonymous Referee #3, Report #2

The reviewer's comments are in **black** and our answers in **blue.**

This is a review of the manuscript "River intermittency: mapping and upscaling of water occurrence using unmanned aerial vehicle, Random Forest and remote sensing landscape attributes", authored by Soares et al. and submitted to Hydrology and Earth System Sciences. The manuscript explores the mapping and modelling of the spatio-temporal dynamics of an intermittent river. The manuscript combines unmanned aerial vehicle surveys (UAV), Random Forest models and remote sensing. The manuscript applies Random Forest models using several predictors such as Sentinel MNDWI, Planetscope NDVI and 30 days accumulated precipitation. The paper aims to fill the gap in understanding of spatial patterns of river intermittency. The authors responded to the previous reviews and included a "2.6 Work limitations" section and other corrections along the text. The results are interesting for Hydrology and Earth System Sciences readers. However, the manuscript must be improved for final publication. I have some suggestions for improving the paper. Please, find the comments below.

We sincerely thank the reviewer for their careful reading of our manuscript and for providing constructive and insightful comments. The feedback has helped us clarify key points, improve the presentation of our methods and results, and strengthen the discussion and conclusions. We have addressed each comment in detail below and have made corresponding revisions in the manuscript, which we believe have enhanced the clarity, rigor, and overall quality of the study.

GENERAL COMMENTS

• I understand that the manuscript focused on the Brazilian semi-arid region. However, the manuscript could include several other references relating to the importance of small non-perennial streams. For example: Perez et al. (2020), Godsey & Kirchner (2014), van Meerveld et al. (2019) and Zimmermann et al. (2014), as well as large-scale studies about river intermittency as Prancevic et al. (2025), Reynolds et al. (2015) and Sauquet et al. (2021).

We thank the reviewer for this valuable suggestion. We agree that placing our results within the broader literature on small non-perennial streams strengthens the general relevance of the study. For this, we have revised the Introduction to include additional references addressing both process-scale and large-scale perspectives on intermittent streams, including Reynolds et al. (2015), Sauquet et al. (2021), Godsey and Kirchner (2014), van Meerveld et al. (2019), and Prancevic et al. (2025):

> ***1 Introduction***
> **Lines 32-34 of the revised manuscript (clean version):**
> *"Additionally, regions already prone to flow cessation are likely to present an amplification of drying, expressed as increase in drying extent and duration under climate change scenarios (Reynolds et al., 2015; Sauquet et al., 2021)."*

Lines 44-45:

"In addition to this temporal discontinuity, flow intermittency interrupts hydrological connectivity along the river and produces spatial discontinuity as well. This happens both by unconnected stretches of the river and contraction of the entire network (Godsey and Kirchner, 2014; van Meerveld et al., 2019; Prancevic et al., 2025)."

To better frame our findings from the Brazilian semi-arid region in a wider global context, we also included additional references highlighting the specific mechanisms from non-perennial streams that we observed in our study (e.g. drainage area vs water occurrence), including Zimmermann et al. (2014), Reynolds et al. (2015), Perez et al. (2020), Godsey and Kirchner (2014), van Meerveld et al. (2019), and Prancevic et al. (2025):

4.2 Identification of important predictors

Lines 359-364:

"Reaches with larger drainage areas are therefore more likely to sustain surface water for longer periods than headwater reaches with small contributing areas. This relationship is demonstrated in process-based studies of connectivity and its drivers in non-perennial rivers, which show that drainage area explains patterns and magnitude of flowing conditions (Zimmermann et al., 2014; Reynolds et al., 2015; Perez et al., 2020). This is also observed during periods of river network contraction, when headwater streams are pruned in dry years (Godsey and Kirchner, 2014; van Meerveld et al., 2019; Prancevic et al., 2025)."

• The manuscript should include an assessment of the uncertainty associated with ground-truth data obtained from UAV surveys. The manuscript could clarify the criteria used to select monitored reaches. Why do the monitored reaches represent the intermittency of the entire area?

We thank the reviewer for this constructive comment. We have revised the manuscript to explicitly address both the uncertainty associated with UAV-based ground-truth data and the representativeness of the monitored reaches.

Regarding ground-truth uncertainty, we expanded the discussion in Section 4.1 to explicitly acknowledge the inherent uncertainty associated with visual interpretation of UAV imagery:

4.1 Observed water intermittency: UAV imagery

Lines 325–331:

"High-resolution UAV imagery enabled detailed visual classification of water occurrence classes. However, visual interpretation inherently brings uncertainty to the ground-truth

generation. Ambiguous surfaces, such as distinguishing between 'Wet' and 'Transition' conditions, may introduce classification errors. To mitigate this uncertainty, ground-truth data was generated using the most frequent class within each modelling unit. This aggregation reduced spatial resolution of the analysis by summarizing 1 m classified segments into 100 m reaches. However, we also reduced the influence of local misclassification and increased robustness of the ground-truth representation. Field observations during the UAV campaigns also supported the interpretation of imagery and helped the classification."

Regarding the selection and representativeness of monitored reaches, we clarified the criteria used to select reaches in Section 3.2.3. Specifically, we now state that monitored reaches were selected to encompass a range of landscape attributes across the studied river:

3.2.3 River reaches: data collection with UAV imagery
Lines 131-134:
"Monitored reaches were selected to capture the spatial variability across the study area, including gradients drainage areas and elevations. Therefore, reaches were distributed across the Umbuzeiro River to represent both upstream and downstream conditions. As such, the monitored reaches are considered representative of the dominant intermittency patterns within the study area."

We believe these revisions improve transparency and clarify both the limitations and the representativeness of the ground-truth dataset.

• Figure 5 should be revised, because the first frame shows a Dry segment where the streambed is clearly covered by vegetation.

We thank the reviewer for highlighting the apparent mismatch in Figure 5. In this study, dry segments are defined by the absence of ponded, even when low vegetation is present on the channel bed. Although a close-up inspection of the original image and field observations confirmed that the riverbed was dry at this location, we recognize that this may not have been sufficiently clear from the figure alone.

To avoid this potential misunderstanding, we have replaced the first frame (and repositioned the second) with a clearer example of classified segments. The revised figure more clearly illustrates the classification scheme, and the caption has been updated accordingly. We believe these changes resolve the reviewer's concern and improve the clarity of Figure 5.

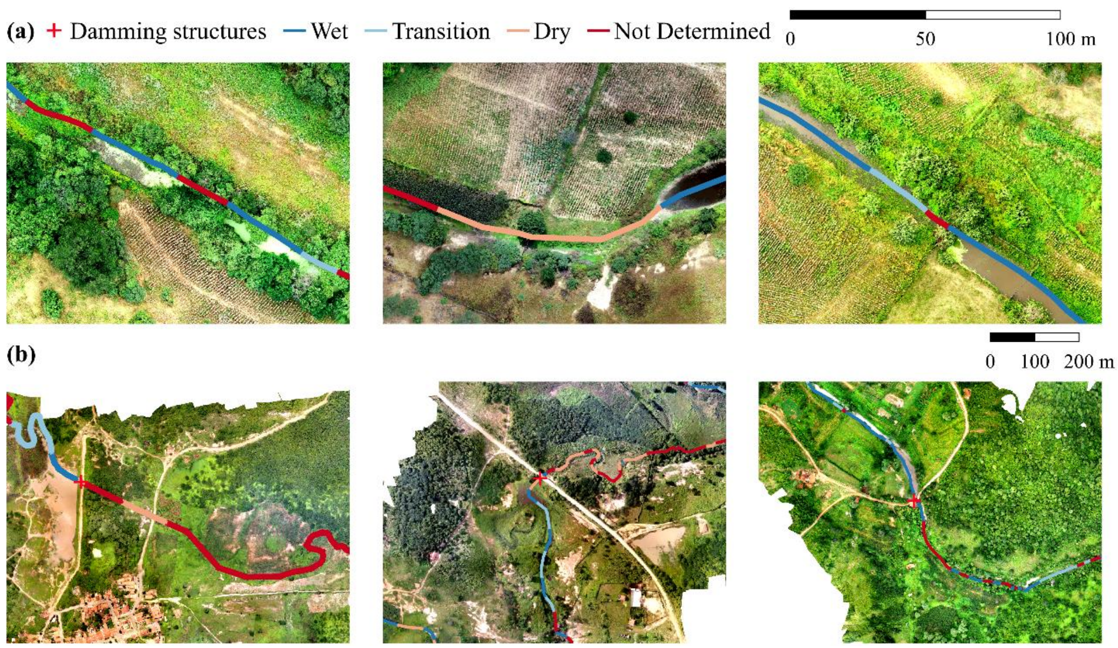

Figure 5. Examples of UAV imagery showing water occurrence classes along the Umbuzeiro River. High-resolution classification of water occurrence (1.0 m reaches) was based on visual interpretation of UAV imagery supported by field observations. We show in (a) samples of different water occurrence conditions and in (b) different examples of damming structures.

• The study used only a 30-day precipitation index. However, the manuscript showed the precipitation distribution over a year and a clear dry period. Therefore, the 30 days accumulated rainfall may not capture the rainfall seasonality, which is important for intermittent stream activation (from dry to wet). I suggest the manuscript tests more than 30 days of accumulated rainfall as Random Forest predictor.

We thank the reviewer for this insightful comment regarding the role of rainfall on intermittent stream activation. During preliminary analyses, we tested multiple precipitation accumulation windows ranging from 1 to 60 days (for both antecedent precipitation index and accumulated precipitation) as potential predictors in the Random Forest models (Fig. R1). These alternative accumulation periods showed very similar predictive performance and variable importance, with many accumulation lengths grouped together and no clear improvement associated with longer or shorter windows. In Fig R1, we use model a, b and c (using Sentinel indices, Planetscope indices and antecedent precipitation, respectively) and none of the precipitation variables were among the most important predictors, except for model c, in which multiple of these predictors were cluttered together.

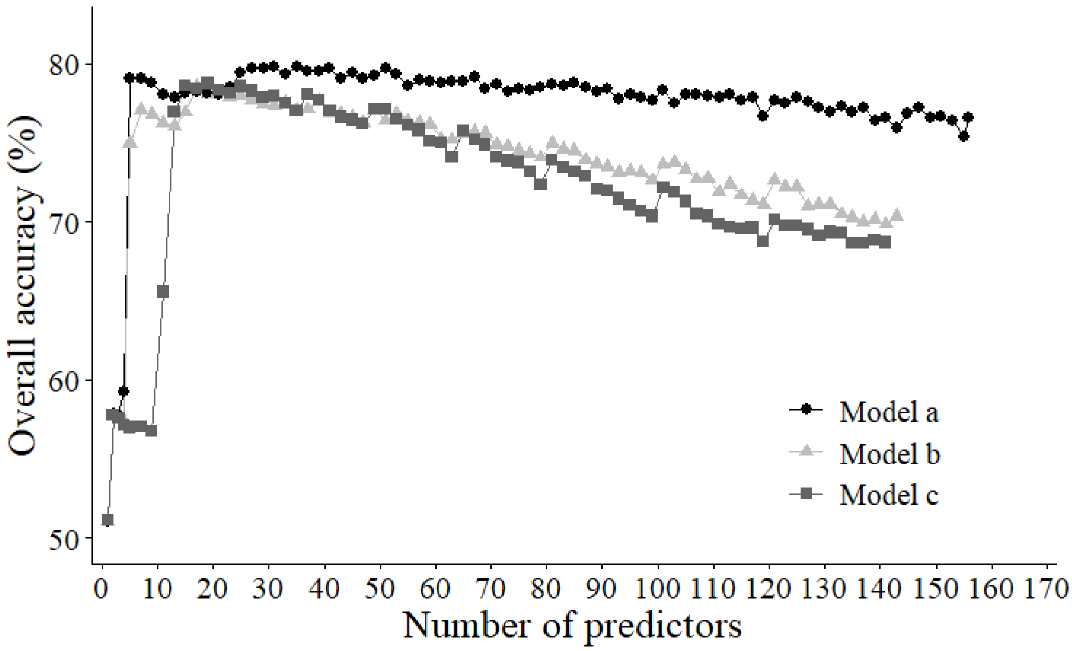

Figure R1. *Sensitivity of Random Forest performance to precipitation accumulation period.*

Based on these results, we retained a single accumulation period (30 days for both antecedent precipitation index and accumulated precipitation) to avoid overparameterization and collinearity among predictors, and to maintain consistency with existing literature (Beaufort et al. 2019). Importantly, the 30-day index was subsequently identified as an important predictor in the final model c, indicating that it adequately captures the relevant antecedent moisture conditions despite the pronounced seasonal rainfall regime.

We have clarified this methodological choice in the revised manuscript to better justify the selection of the 30-day accumulation period:

> ***3.2.6 Hydrological data***
> **Lines 202-206:**
> *"The sensitivity of model performance to the length of the accumulation window was evaluated using periods ranging from 1 to 60 days. Model performance and predictor importance were consistent across tested windows, with no systematic improvement associated with alternative accumulation periods. Therefore, only the preceding 30 days are used, in accordance with the results of Beaufort et al. (2019) that highlighted the importance of this predictor in river intermittency modelling with Random Forest."*

• The use of "non-perennial rivers" instead of "temporary rivers" could clarify the communication, as discussed in Busch et al. (2020).

Thank you for this suggestion. We have replaced the term "temporary rivers" with "non-perennial rivers" throughout the manuscript.

• In the study gap, the manuscript mentioned “interaction with human modifications, such as farmer dams, to influence the presence of water on river reaches”. However, the manuscript assessed only presence and distance from farmer dams. Providing a better description of dam characteristics, such as their use and reservoir capacity, would improve the manuscript discussion.

We thank the reviewer for this valuable suggestion. We agree that dam characteristics such as use and storage capacity are important controls on their influence on water occurrence. In the present study, however, available data only allowed us to assess the presence of farmer dams and their distance to river reaches, which were used as proxies for potential human modifications. To address this limitation, we revised the manuscript to clarify the scope of the dam-related analysis and avoid overinterpretation:

> ***1 Introduction***
> **Lines 76-78:**
> *"Although the general role of topographic and climatic drivers is well established, little is known about how proximity to human modifications, such as farmer dams, may influence the presence of water in river reaches."*

We also expanded the discussion in Section 4.2 to explicitly state that the absence of detailed dam characteristics limits process-based interpretation of dam impacts, and that future work would benefit from incorporating reservoir capacity, for example, as an explanatory variable:

> ***4.2 Identification of important predictors***
> **Lines 404-407:**
> *"Our analysis considered the distance of dams as a proxy for potential human influence on water occurrence. However, detailed information on dam characteristics, such as reservoir capacity, was not available. These characteristics likely modulate the magnitude and spatial extent of dam impacts on downstream water presence and should therefore be considered in future studies."*

SPECIFIC COMMENTS

L23: “The presence of intermittent and ephemeral rivers is increasingly prevalent in drainage networks around the world”. Reference is missing.

Thank you for noting this. We have added the reference Messager et al. (2021) to support this statement.

L35: “Intermittent rivers are characterized by periods of drying and re-wetting”. Including the concept of intermittent rivers and stream presented in the paper (e.g., Busch et al., 2020).

Thank you for this suggestion. We have revised the sentence to include a reference to Busch et al. (2020), linking our definition of intermittent rivers to the broader literature.

> ***1 Introduction***
> **Lines 41-42:**
> *"Intermittent rivers are non-perennial rivers that periodically cease to flow but maintain surface water connectivity over extended periods (Busch et al., 2020)."*

L81: "1000 km²" must include the thousand separators: 1,000 km².

Thank you for noting this. We have revised the text.

L86: What is the importance of the sentence "There is a large number of reservoirs in the area"? How about the impact of reservoirs in the river intermittency?

Thank you for this comment. We have revised the sentence to clarify its relevance by explicitly linking the presence of reservoirs to their potential impact on river intermittency:

> **Lines 95-96:**
> *"There is a large number of reservoirs in the area, which may impact river intermittency by modifying water permanence and downstream drying patterns."*

L158: Table 1 should be included after the line where it is called.

Thank you for noting this. Table 1 has been moved to immediately follow its first citation in the text.

L167: The manuscript should include the resample method employed.

Thank you for this comment. We have clarified the resampling method used in the analysis by specifying that nearest-neighbour resampling was applied, consistent with the default resampling behaviour in Google Earth Engine. This information has now been included in the manuscript.

> **Lines 181-182:**
> *"The Sentinel indices with SWIR2 or red edge bands (20 m resolution bands) were resampled at a resolution of 10 m using nearest-neighbour interpolation."*

L183: In the sentence "We use daily hydrological data to take into account precipitation and changes in the reservoir located at the outlet of the Benguê catchment". It is not clear what is meant by "changes in the reservoir". Please, specify whether this refers to water level and volume of Benguê reservoir in this sentence.

Thank you for this comment. We have revised the sentence to explicitly specify that "changes in the reservoir" refer to variations in the water level and storage volume of the Benguê reservoir, improving clarity at first mention.

> **Lines 198-199:**
> *"We use daily hydrological data to take into account precipitation and changes in the reservoir located at the outlet of the Benguê catchment, specifically variations in water level and storage volume."*

L194-195: Please inform data units.

Thank you for noting this. We have revised the text.

L302: Write the acronym "LAI" in full.

Thank you for noting this. We have revised the text.

L318: "he five most important…" must be corrected to "The five most important…"

Thank you for noting this. We have revised the text.

L329-332: "Catchment area or drainage area are sometimes identified as very important variables to classify streams as temporary or perennial (González-Ferreras and Barquín, 2017; Snelder et al., 2013). Altitude is another important variable to identify intermittent streams (D'Ambrosio et al., 2017; González-Ferreras and Barquín, 2017).". The manuscript could include a short discussion relating to drainage area and altitude to river intermittency.

We thank the reviewer for this suggestion. We have added a short discussion clarifying the hydrological mechanisms linking drainage area and altitude to river intermittency (Section 4.2):

> ***4.2 Identification of important predictors***
> **Lines 358-370:**
> *" Drainage area integrates upstream contributing catchment area and, by extension, potential water inputs to the channel network. Reaches with larger drainage areas are therefore more likely to sustain surface water for longer periods than headwater reaches with small contributing areas. This relationship is demonstrated in process-based studies of connectivity and its drivers in non-perennial rivers, which show that drainage area explains patterns and magnitude of flowing conditions (Zimmermann et al., 2014; Reynolds et al., 2015; Perez et al., 2020). This is also observed during periods of river network contraction, when headwater streams are pruned in dry years (Godsey and Kirchner, 2014; van Meerveld et al., 2019; Prancevic et al., 2025).*
>
> *"Altitude may further modulate river intermittency through its influence on catchment morphology and hydrological processes. Because our study focuses on a single river, altitude shows a consistent downstream gradient and scales with drainage area, with*

lower elevations corresponding to larger contributing areas. This relationship may differ when comparing multiple river reaches at similar altitudes across the catchment, where contributing areas might vary. In our study, the observed patterns of water presence along the river network are consistent with the influence of both drainage area and altitude and likely reflect their role in controlling flow permanence."

L343-344: "This is particularly relevant in semi-arid regions, where it is common to use small-scale storage and retention of surface water. However, as river networks become more intermittent due to climate-driven changes, this can be a reality in all climates.". Reference is missing.

Thank you for noting this. We have added the reference Messager et al. (2021) to support this statement.

L415-416: "The identification of areas prone to wetter conditions is very important even in the smallest of scales because they can be key areas for river ecology, for instance.". Reference is missing.

Thank you for noting this. We have added the reference Fencl et al. (2015) to support this statement.

L425-427: "The mapping of intermittency of water occurrence throughout the river in temporary rivers is important to analyse the migration and resilience of species, to understand their habitat and to conduct studies on intermittent river dynamics.". Reference is missing.

Thank you for noting this. We have added the reference Sarremejane et al. (2017) to support this statement.

REFERENCES

Busch, M. H., Costigan, K. H., Fritz, K. M., Datry, T., Krabbenhoft, C. A., Hammond, J. C., Zimmer, M., Olden, J. D., Burrows, R. M., Dodds, W. K., Boersma, K. S., Shanafield, M., Kampf, S. K., Mims, M. C., Bogan, M. T., Ward, A. S., Rocha, M. P., Godsey, S., Allen, G. H., … Allen, D. C. (2020). What's in a name? Patterns, trends, and suggestions for defining non-perennial rivers and streams. Water (Switzerland), 12(7). https://doi.org/10.3390/w12071980

Fencl, J. S., Mather, M. E., Costigan, K. H., and Daniels, M. D.: How big of an effect do small dams have? Using geomorphological footprints to quantify spatial impact of low-head dams and identify patterns of across-dam variation, PLoS ONE, 10, https://doi.org/10.1371/journal.pone.0141210, 2015.

Godsey, S. E., & Kirchner, J. W. (2014). Dynamic, discontinuous stream networks: Hydrologically driven variations in active drainage density, flowing channels and stream order. Hydrological Processes, 28(23), 5791–5803. https://doi.org/10.1002/hyp.10310

Messager, M. L., Lehner, B., Cockburn, C., Lamouroux, N., Pella, H., Snelder, T., Tockner, K., Trautmann, T., Watt, C., and Datry, T.: Global prevalence of non-perennial rivers and streams, Nature, 594, 391–397, 2021.

Perez, A. B. A., Santos, C. I. dos, Sá, J. H. M., Arienti, P. F., & Chaffe, P. L. B. (2020). Connectivity of ephemeral and intermittent streams in a subtropical atlantic forest headwater catchment. Water (Switzerland), 12(6). https://doi.org/10.3390/W12061526

Prancevic, J. P., Seybold, H., & Kirchner, J. W. (2025). Variability of flowing stream network length across the US. Science, 387, 782–786. https://doi.org/10.1126/science.ado2860

Reynolds, L. V., Shafroth, P. B. & LeRoy Poff, N. Modeled intermittency risk for small streams in the Upper Colorado River Basin under climate change. Journal of Hydrology. 523, 768–780. https://doi.org/10.1016/j.jhydrol.2015.02.025

Sauquet, E., Beaufort, A., Sarremejane, R., & Thirel, G. (2021). Predicting flow intermittence in France under climate change. Hydrological Sciences Journal, 66(14), 2046–2059. https://doi.org/10.1080/02626667.2021.1963444

Sarremejane, R., Cañedo-Argüelles, M., Prat, N., Mykrä, H., Muotka, T., and Bonada, N.: Do metacommunities vary through time? Intermittent rivers as model systems, Journal of Biogeography, 44, 2752–2763, 2017.

van Meerveld, H. J. I., Kirchner, J. W., Vis, M. J. P., Assendelft, R. S., & Seibert, J. (2019). Expansion and contraction of the flowing stream network alter hillslope flowpath lengths and the shape of the travel time distribution. Hydrology and Earth System Sciences, 23(11), 4825–4834. https://doi.org/10.5194/hess-23-4825-2019

Zimmermann, B., Zimmermann, A., Turner, B. L., Francke, T., & Elsenbeer, H. (2014). Connectivity of overland flow by drainage network expansion in a rain forest catchment. Water Resources Research, 50(2), 1457–1473. https://doi.org/10.1002/2012WR012660