

## Author's response to Reviewer 2 comments

EGUSPHERE-2025-837 | Research article

### Manuscript Title: Assessment of source regions of the Zambezi River: implications for regional water security.

The authors would like to thank the anonymous reviewer and the editor (Professor Hubert H.G. Savenije) for their time and effort in providing their expert views and comments on the manuscript during the review process.

As per the journal's instructions, we are currently in the final response phase and are providing detailed replies to all referee and community comments. A revised manuscript has not yet been submitted, as this is not requested at this stage of the review process. Where relevant, we describe changes to the manuscript by referring to specific sections or content rather than line numbers or tracked edits, since the revised manuscript is not provided at this stage.

We have made every effort to address the points raised, as detailed below.

**Reviewer 2: Citation:** <https://doi.org/10.5194/egusphere-2025-837-RC2>

Overall comments	Authors response
I have reviewed the submission by Lourenco et al, on the assessment of source regions of the Zambezi River: Implications for regional water security. The manuscript investigates source regions of the Zambezi water towers (Luffician Arc and Angolan Highlands). These regions are data scarce and critical for water resources management at transboundary level. The following should be addressed to make it suitable for an international journal like HESS:	<p>We thank the reviewer for their careful reading and thoughtful suggestions, which have helped us strengthen and clarify the manuscript. We address each of the points raised below.</p> <p>We hope that these comments and revisions make the manuscript's contributions more compelling and clear for a broader international readership.</p>

Specific comments	Authors response
1. Novelty - What is the scientific knowledge that this study is bringing forward/advancing. For the people in the Zambezi Basin, this is clear but the study must be appreciated by a broader audience.	<p>We appreciate this important question and agree that we needed to more clearly articulate the novelty of our contribution for an international audience. While local and regional researchers may be aware of the Angolan Highlands' importance to the Zambezi system, there has been no integrated assessment of the hydrological, geomorphological, and water quality contributions of these headwaters across multiple disciplines and data sources.</p> <p>The opening paragraph of the Discussion summarizes the salient findings of this study. And here we present their wider context and relevance to the readership of this journal.</p> <p>To our knowledge, this was the first study to:</p> <ol style="list-style-type: none"><li>1. Conduct GPS-tracked ground expeditions to map the Zambezi River from both Zambian and Angolan sources. The hydrological and geomorphological knowledge of the headwaters was aided by the use of these transects to measure and compare river lengths.</li><li>2. Specifically in Angola, where no previous discharge data has been published or reported, we present new ADCP-based flow measurements across a number of important tributaries. For many of these sites, these are the only field-based discharge data available. By merging this flow data with previous gauge station data, the Angolan and Zambian contribution to the Zambezi (upstream of the Barotse wetland) was estimated.</li></ol>

	<p>3. We examined two of the most recent EO-based modelled discharge products for the Upper Zambezi sub-basins (Collins et al., 2024, and Akpoti et al., 2024) and found inconsistencies and limits in comparison to our ADCP data and historical gauge station data.</p> <p>4. Provide an inventory of wetlands and the occurrence and seasonality of surface water, including assessments of water chemistry and quality, emphasising the Upper Zambezi's natural (undammed) hydrological behaviour, especially in Angola, which has received less attention in the literature than Zambia's more extensively researched wetland areas.</p> <p>In response, we have revised the abstract, introduction, and discussion to better highlight the manuscript's key contributions.</p>
<p>2. Unvalidated statements: In sections of the paper, the authors highlight two things which I feel are unvalidated: (a) reduced elevated conductivity, salinity, TDS are likely introduced by mining. Several assessments conducted in this catchment do NOT show this. In any case, can you explain how mining is reducing the EC? (b) Angola hosts primary aquifers of the Zambezi - again this is difficult to validate based on the data available in this manuscript.</p>	<p>We note the need for caution and clarification regarding these statements. We have clarified these points in the revised manuscript to better contextualise our findings and their implications.</p> <p>We are satisfied that our data provides a direct and temporally aligned comparison regarding the elevated conductivity (rather than reduced EC as noted by the reviewer) from the Kabompo River in comparison to the Zambezi and Lungwebungu River systems. Our findings align with broader concerns about anthropogenic pressures in the Kabompo/Copperbelt region, which are well-documented. Our intent was not to present this comparison as a definitive, seasonally controlled analysis, but rather as an initial observational contrast that raises important questions about localised impacts of land use, particularly mining, on water quality in Zambia. Note that the Wilderness Project is currently conducting (having started on 3 June 2025) a river expedition specifically along the Kabompo River in Zambia, with the intention of reporting further details regarding potential water chemistry concerns on this major tributary.</p> <p>Regarding the AHWT as the primary aquifer of the Zambezi, we have made changes to the manuscript that softens this stance, in line with the need for caution. We acknowledge that this work is foundational rather than definitive, serving as a call for further research into the entire Upper Zambezi and, crucially, for long-term monitoring. We advocate for the establishment of gauging stations, particularly in Angola, and the maintenance of existing stations in Zambia, to build upon this first step in quantifying the hydrology (and primary aquifer) of this critical region.</p>
<p>3. Flow accumulation and river discharge: Measurements of ADCP need to be clear if they are mean or one-time measurements. In some section, specific dates are placed, whereas other not placed.</p>	<p>Thank you for the comment, we have clarified that all ADCP measurements were single-time observations taken during specific expedition dates. Their mean value indicates the mean over the sampling effort and does not represent a mean daily/ monthly flow, we appreciate that this can be confusing to our audience. The dates had been added in all relevant sections and figure captions in the original draft. We also now more clearly state the limitations of this snapshot approach and that the results should be seen as indicative rather than representative of long-term flow.</p>
<p>4. Some sections of the introduction can be reduced and benefit from a refined perspectives on headwater analysis/ literature review. For me section 1.1 and 1 should be combined.</p>	<p>We agree that the introduction can be made more concise and focused. In response, we have revised and streamlined the content, combining Sections 1 and 1.1 into a single, more cohesive introduction. In doing so, we have refined the discussion of headwater analysis and related literature to better frame the context and motivation for our study.</p>

