**Dear Editors,**

We are to submit our manuscript entitled **“Regional Base-Flow Index in Arid Landscapes Using Machine Learning and Instrumented Records”** for consideration in Journal of Hydrology: Regional Studies. This work presents a novel integration of streamflow observations and machine learning to characterize base-flow dynamics across diverse physiographic and climatic regions in Arizona, USA.

Dryland regions face critical water challenges yet are often underrepresented in hydrologic analyses due to sparse monitoring networks and unique hydrogeologic characteristics. Our study addresses this gap by (1) analyzing long-term base-flow index (BFI) trends from 205 instrumented streamgages, and (2) using the eXtreme Gradient Boosting (XGBoost) algorithm to predict long-term BFI in ungauged catchments. The resulting spatial patterns and model insights contribute to improved understanding of groundwater–surface water interactions in water-limited environments.

In response to reviewer feedback (Manuscript Number *EJRH-D-25-00805*), we revised the manuscript to improve clarity and expand explanations where appropriate. We added context about the choice and limitations of baseflow separation methods, improved discussion of temporal versus spatial modeling alignment, and clarified key aspects of model selection and validation. These revisions aim to ensure the manuscript’s analytical choices and results are more transparent and grounded in regional hydrologic context.

We also made changes to improve how the model’s strengths and limitations are presented. This includes clarifying how the model was validated, providing additional performance comparisons, and explaining why certain methods were selected. Our goal was to better illustrate the applicability of the modeling approach while acknowledging areas where future work could extend or refine our results.

We believe our manuscript is a strong fit for Journal of Hydrology: Regional Studies, as it provides new insights into regional hydrologic processes, with direct applications for managing water resources under climate and land-use pressures. Our interdisciplinary approach combining hydrologic analysis, climate data, and machine learning is aligned with the journal’s emphasis on region-specific solutions, modeling, and translational science.

We confirm that neither the manuscript nor any part of its content is currently under consideration for publication elsewhere or has been previously published. All authors have approved the manuscript and agree with its submission to Journal of Hydrology: Regional Studies.

Thank you for your consideration. We look forward to the opportunity to contribute to your journal.

Sincerely,  
**Caelum Mroczek** (corresponding author)  
on behalf of all co-authors