

Review of the manuscript ‘*A hydrogeomorphic dataset for characterizing catchment hydrological behavior across the Tibetan Plateau*’ submitted to *ESSD*.

Recommendation: **ACCEPT**

The Focus of the paper is on hydrologic and geomorphic processes which are intricately linked within the Earth system. Such systems are jointly characterizing terrestrial hydrological behaviors and biogeochemical cycles across diverse temporal and spatial scales.

Relevance: The presented study is the original primary research within scope of the journal which gets insights into the Tibetan Plateau. The Tibetan Plateau provides an ideal setting for investigating the interactions between hydrological and geomorphic processes in a largely pristine natural environment.

Title: the title and abstract of this paper clearly reflect its content.

Abstract is well written and clearly describes the undertaken study.

Structure: The article is well organized with structured sections. The structure of the manuscript conforms to the journal standards and discipline norm. The numeration of the sections is correct and consecutive.

Logic: Overall, the presentation of the work clear, with regards to language and grammar. The clarity of the text logic and organization of the paper is sufficient. It demonstrates the consistent interpretation of the results with detailed explanations and comments. A comparison of the results with those in previous studies is presented.

Introduction presents a background, defines research goals and provides a clear statement of research problem. The introduction presents the purpose of the research investigation and the purpose is supported by the pertinent literature. The Introduction well describes the research. Introduction and background show context of the article. Literature is well referenced and relevant.

Study area: is described with sufficient details.

Research questions and goal are identified. Objectives are relevant to the study aim.

Literature regarding the relevant topics is reviewed, formatted according to the journal rules and appropriately referenced. Major sources include published papers on basin hydrology, geomorphology and Earth science data.

Research gaps and weakness in former works are described; the existing gaps are identified. The contribution of this work filling this gap is explained.

Motivation is explained: The interactions between hydrologic and geomorphic processes remain largely unknown due to challenging physical conditions and data limitations.

English language: acceptable. Clear, unambiguous, professional English language used throughout.

Data used in this study are described: The authors presented a dataset which comprises 18 hydrogeomorphic metrics, particularly along with the width function and width function-based instantaneous unit hydrograph (WFIUH) of each catchment.

Methods: Methods described with sufficient detail and information to replicate. The methods are described sufficiently to allow the research study to be repeated by other parties in similar research. Modifications of the existing methods are mentioned briefly. The workflow is well structured and clearly described with sufficient information to reproduce the approach.

Results are reported: The authors assessed the data and found that the relationships of time-to-peak against the hydro-geomorphic metrics are similar to those of peak flow but in an opposite direction. Moreover, they revealed that catchment concentration time shows a positive relationship with catchment size but a strong negative correlation with catchment slope. The results are relevant to the initial research goals and objectives and report major achievements of this study.

Discussion interpreted the major outcomes of this study. Among others, the authors found and reported that the peak flow of WFIUH is positively related to slope and curvature but negatively related to catchment area, perimeter, length, and circularity. The advantages of the obtained results are described and compared for diverse hydrological and geomorphic setting of the region. The Discussion described the issues of methodology and results.

Conclusion Conclusions are well stated, linked to original research question, limited to supporting results and summarized the study with interpretation of facts. The methods presented by the authors can be employed for calculating flow velocity and are useful for similar studies. Moreover, the authors provided a link to the dataset via the Zenodo portal. The conclusions are appropriately stated and connected to the original questions.

Validation and accuracy: The validity of the derived WFIUH has been confirmed by its successful integration into an hourly hydrological model for simulating flash flood events.

Actuality, novelty and importance of the research is clear: This study presents the first version of a novel hydro-geomorphic dataset encompassing diverse catchments across the region of Tibet. Moreover, the presented study can contribute to advancing our understanding of catchment hydrological behaviour in the Tibetan Plateau and hence improving water resources management and disaster mitigation in the region and its downstream.

Academic contribution: Rigorous investigation performed to a high technical and professional standard. The paper increases the knowledge in hydrology and Earth sciences. The paper combines technical, modelling, cartographic and hydrological approaches to data analysis which presents a multi-disciplinary study well deserved to be published in *ESSD*.

Figures The authors presented 9 figures and 2 tables. The output illustrations are of acceptable quality, easy to read, relevant and suitable. Figures are labelled and appropriately described. They illustrate the results of the undertaken study.

Recommendation: This manuscript can be accepted based on the detailed report above.

With kind regards,

- Anonymous Reviewer.

07.12.2023.