A long-term dataset of debris-flow and hydrometeorological observations from 1961 to 2024 at Jiangjia Ravine, China, [Paper # essd-2025-190]

Reply to reviewers' comments

(*C and R denote comment and reply, respectively*)

C0: The manuscript presents a long-term dataset of debris-flow and hydrometeorological observations from 1961 to 2024 at Jiangjia Ravine, China, compiled from the Dongchuan Debris Flow Observation and Research Station (DDFORS). This is a valuable and significant contribution to the field of debris-flow research. Long-term, continuative, and event-specific data of this kind are rare and provide essential support for understanding debris-flow dynamics, temporal trends, and the influence of changing climatic and environmental conditions on debris-flow occurrence and behavior.

However, before the manuscript can be considered for publication, several important points need to be addressed to further improve the clarity, completeness, and usability of the dataset.

R0: Thank you for helping us to improve our manuscript with constructive comments. The dataset has garnered a total of 18,186 views and 3,705 downloads since its release on April 2025. We are delighted to contribute to the fundamental research on debris flows. We have made revisions on a point-by-point basis. Please see our detailed reply to comments below.

C1: In Figure 7, the sediment transported by debris flow shows considerable inter-annual variability. Could the authors clarify whether this level of variation is consistent with the actual field conditions, and if so, provide a reasonable explanation for these fluctuations?
R1: As shown in Figure 3, debris flows indeed occurred in 1968, 1969, 1970, 1971, 1972, 1973, 1976, 1977, 1978, 1979, 1980, 1985, 1986, 2015, 2019, and 2020. However, in these years, the debris flows did not reach the monitoring section, resulting in no observational data (these years are also annotated in Figure 7). Partial surge data are missing for the events in 1974 and 1975, and no total sediment transport data is available for these years.

Overall, the frequency and magnitude of debris flows have significantly declined in recent decades. However, the events in 2023 and 2024 still recorded significant sediment transport volumes of 52,682 m^3 and 31,450 m^3, respectively, which remain substantial for mountainous watersheds. By the way, we are currently analyzing the relationship between climate change and sediment transport, to reveal the key factors that control the declined rate of sediment.

We have added the description in the revised manuscript (Page 12, Line 273-276):

"Overall, the frequency and magnitude of debris flows have significantly declined in recent decades. However, the events in 2023 and 2024 still recorded significant sediment transport volumes of 52,682 m^3 and 31,450 m^3, respectively, which remain substantial for mountainous watersheds. The decreasing trend may be a result of climate change."

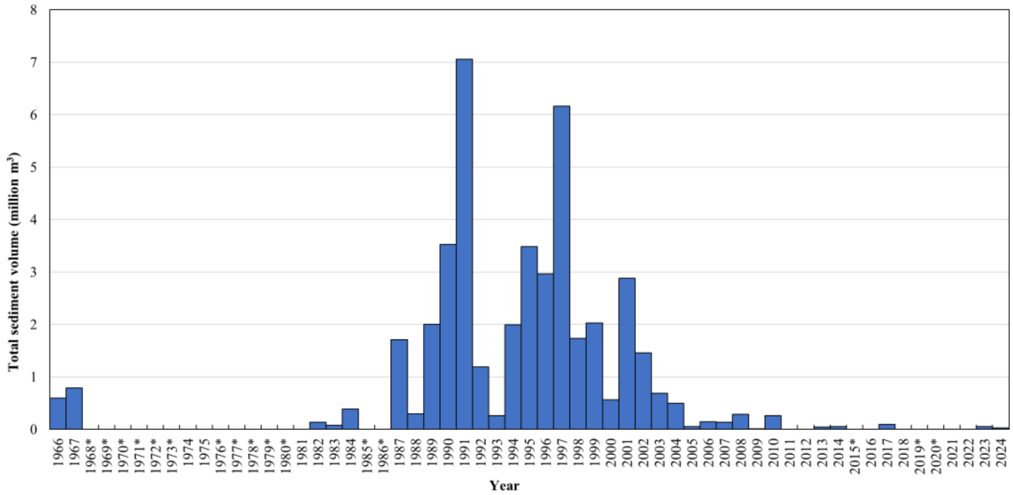


Figure 7. Variation of sediment transported by debris flow recorded from 1966 to 2024. * denotes debris flows occurred without observational data.

C2: The text in Figures 3 and 8b is difficult to read due to low resolution. It is recommended to improve the image quality and enhance the readability of the labels and annotations in these figures.

R2: Thank you for your suggestion. We have redrawn the figure as follows:

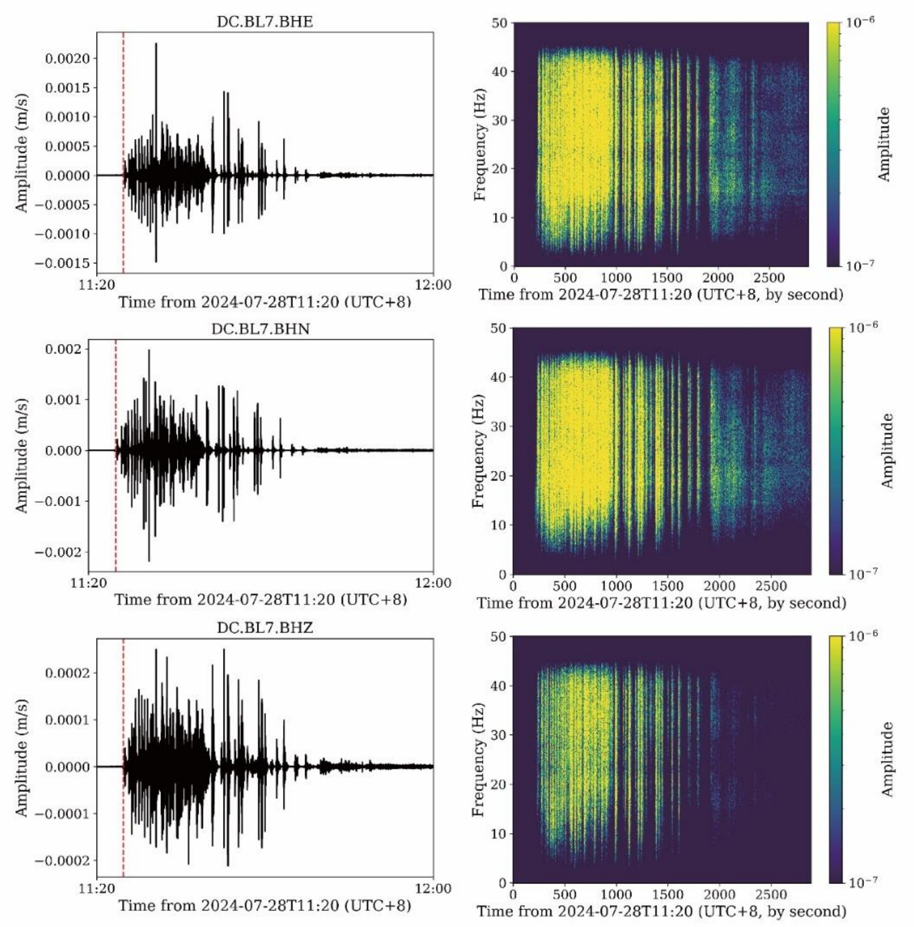


Figure 8. (b) the time-domain seismic signal and time-frequency characteristic curves of the debris-flow event on July 28th, 2024.

C3: In Section 3.1.4, it would be helpful if the authors could provide a few examples of debris-flow monitoring images or video frames captured by the high-resolution cameras. This would better illustrate the application of these instruments in actual debris-flow observation.

R3: Thank you for your suggestion. We have added images of the first debris-flow surge on coarse bed, multiple debris-flow surges, continuative flow, and hyperconcentrated flow, all captured on July 28th, 2024.

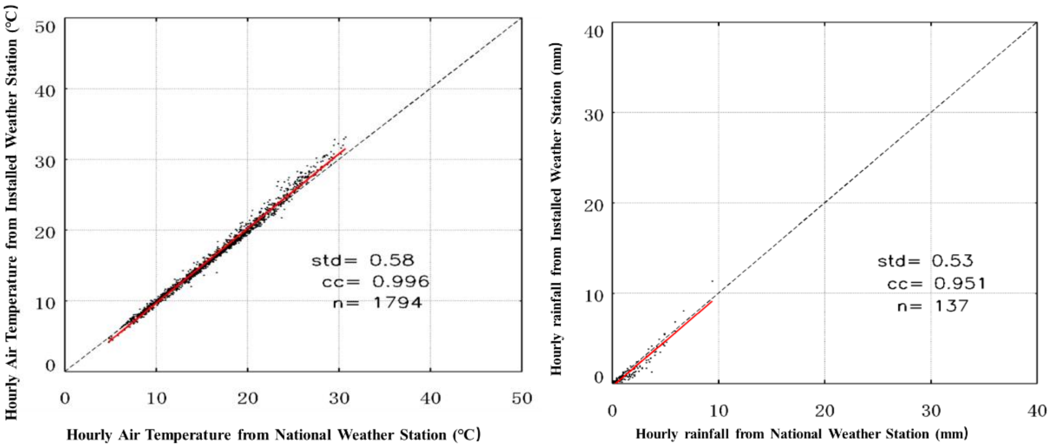
Figure 8. Debris-flow video frames captured on July 28th, 2024.: (a) first debris flow surge on coarse bed, (b) surge flow, (c) continuative flow, and (d) hyperconcentrated flow.

C4: In Figure 13b, the soil moisture distribution at different depths indicates that the middle layer (20 cm) has the highest moisture content, while both the surface layer (10 cm) and lower layer (30 cm) show lower moisture values during the observation period. The authors are encouraged to verify whether this distribution pattern is reasonable and discuss under what conditions the soil moisture at the middle layer would exceed that of both the upper and lower layers.

R4: This trend may be attributed to preferential flow, which is influenced by soil porosity characteristics and texture (cracks). However, we were unable to determine a plausible explanation for this phenomenon. Consequently, we have removed this figure and its accompanying description. We have also documented this modification in the data explanation document.

C5: Regarding data reliability, it would strengthen the manuscript if the authors could clarify whether any cross-validation or data consistency checks were performed to verify the validity of the long-term observations.

R5: Most datasets, including debris-flow kinematic data, particle size distribution of debris flows, rheological data of debris-flow slurry, cross-sectional measurement data, sediment concentration, grain size distribution data, and observation data from runoff plots, were obtained through manual observation. These data are considered to have relatively small errors. Additionally, we performed calibration and verification of rain gauges and weather stations in 2021. Some of the results are shown in the following figures, indicating high reliability.



Accuracy validation of air temperature measurements and hourly rainfall measurements

We have added this information in the revised manuscript (Page 25, Line 474-482):

"Most datasets, including debris-flow kinematic data, particle size distribution of debris flows, rheological data of debris-flow slurry, cross-sectional measurement data, sediment concentration, grain size distribution data, and observation data from runoff plots, were obtained through manual observation. These data are considered to have relatively small errors. Additionally, rainfall data from tipping-bucket rain gauges, collected prior to 2024, showed high reliability when cross-validated with data from regional national meteorological stations. In 2024, piezoelectric rain gauges and meteorological stations were installed and underwent performance verification at national benchmark sites before deployment. The correlation coefficients between these instruments and the reference data from national meteorological stations were 0.951 for the piezoelectric rain gauges and 0.996 for the meteorological stations." **C6**: There are still several language and formatting errors throughout the manuscript. For instance, in the caption of Figure 1, (c) is incorrectly labeled as (b).

R6: We sincerely thank the reviewer for highlighting the language and formatting errors. The error in the caption of Figure 1 has been corrected. Additionally, we have thoroughly proofread the entire manuscript to identify and address any other language and formatting issues.

C7: Additionally, the sentence on Line 104 "This paper summarizes of the debris-flow observation at Jiangjia Ravine and overviews of the core data", contains grammatical errors. The authors are advised to carefully proofread the entire manuscript to correct such issues and ensure consistency in figure captions, labeling, and overall language quality.

R7: Thank you for highlighting the grammatical errors in our manuscript. We have revised it: "This paper summarizes the debris-flow observations at Jiangjia Ravine and provides an overview of the core data." We have thoroughly proofread the entire manuscript to correct similar grammatical issues. Additionally, we have ensured consistency in the figure captions, labeling, and overall language to enhance the clarity and professionalism of our paper.