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*)

Reviewer 1

C0: General comments:

This is a rich and unique dataset, which can potentially very useful for future research. I am not aware of anything similar in landslide/debris-flow research. Therefore, this could be a seminal contribution in terms of open data research. The authors did a great job in collecting and synthesizing the different datasets and translating descriptions and headers to English. All links to the dataset work and the data can be downloaded. Before publication, I think some figures and example data could be presented differently. Furthermore, some more details on assumptions and calculations could be added (see comments below). In my opinion, it can be published in ESSD if these points are addressed.

R0: Thank you for the 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:L42-L57: this is a nice list of monitoring installations, but would be much more accessible if you could put them in a map or table.

R1: Thank you for the suggestion. We have added a table that includes the installation year of each monitoring station, maximum altitude, drainage area, and main channel length of each catchment.

Table 1 Characteristics of typical monitoring sites

Catchment	***Country-Region***	***Year of installation***	***Maximum altitude (m asl)***	***Drainage area (km^2)***	***Main channel length (km)***	***Reference***
Lattenbach	*Austria*	*2002*	*2930*	*5.3*	*5.2*	*Hübl and Moser, 2006;Hübl and Kaitna, 2010; Hübl et al., 2017*
Wartschenbach	*Austria*	*1995*	*2113*	*2.7*	*3.6*	*Fuchs et al., 2012*
Illgraben	*Switzerland*	*2000*	*2716*	*11.7*	*5.5*	*McArdell et al., 2007; Berger et al., 2011; Hirschberg et al., 2021; Aaron et al.,2023; Raffaele and Jordan, 2024*
Dorfbach	*Switzerland*	*1993*	*4545*	*5.6*	*3.2*	*Willi et al.,2015*
Spreitgraben	*Switzerland*	*2009*	*3263*	*4.7*		*Tobler et al., 2014*
Moscardo	*Italy*	*1989*	*2043*	*4.7*	*2.76*	*Marchi et al., 2002; Blasone et al., 2015*
Acquabona	*Italy*	*1997*	*2667*	*0.3*	*1.6*	*Berti et al., 1999; Genevois et al., 2000;*
Gadria	*Italy*	*2011*	*2945*	*6.3*	*3*	*Comiti et al., 2014; Theule et al., 2018*

Manival	*France*	*2010*	*1738*	*3.6*	*1.8*	*Theule et al., 2015; Bel et al., 2015*
Réal	*France*	*2010*	*2090*	*2.3*	*2.6*	*Navratil et al., 2013*
Rebaixader	*Spain*	*2009*	*2475*	*0.53*	*1.4*	*Abancó et al., 2014*
Portainé	*Spain*	*2015*	*2439*	*5.72*	*5.7*	*Hürlimann et al., 2013*
Kamikamihorizawa	*Japan*	*1970*	*2455*	*0.8*	*2.5*	*Suwa et al., 1993; Okano et al., 2012; Ikeda et al., 2023*
Chalk Cliffs	*USA*	*2004*	*3140*	*0.3*	*1*	*Pierson ,1986; Coe et al., 2010; McCoy et al., 2011, 2012*
Shenmu	*Taiwan, China*	*2002*	*2850*	*72.2*	*17.7*	*Yin et al., 2011*
Yushui Stream	*Taiwan, China*	*2018*	*2756*	*12.3*	*7.31*	*Liu and Wei, 2024*
Jiangjia Ravine	*China*	*1961*	*3269*	*48.6*	*13.9*	

C1:L44: I don't think Erlenbach produces debris flows, but bed load transport. Please double check

R1: Thank you for the kind reminder. We have checked the characteristics of the Erlenbach Torrent and confirmed that bedload, not debris flow, is transported in this catchment. Therefore, we have removed this catchment from the manuscript.

C2: Figure 3: this is a bit small. Maybe you can flip it by 90° and fill a page?

R2: We have flipped it by 90° and fill a full page. Please see the revised manuscript.

C3: Figure 4: I would add the channel bed to panel c. Is flow depth $H+h$ or only H?

R3: The flow depth is H. According to your suggestion, we added the channel bed to the figure as follows

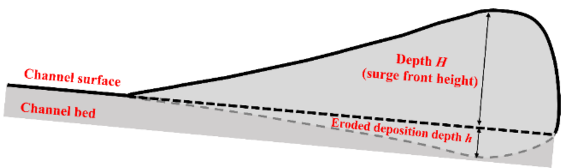


Figure 4. (c)illustration of flow depth

C4:L220: please add that you assume a rectangular channel cross section.

R4: We added this assumption in the revised manuscript (Page 9, Line 221-223):

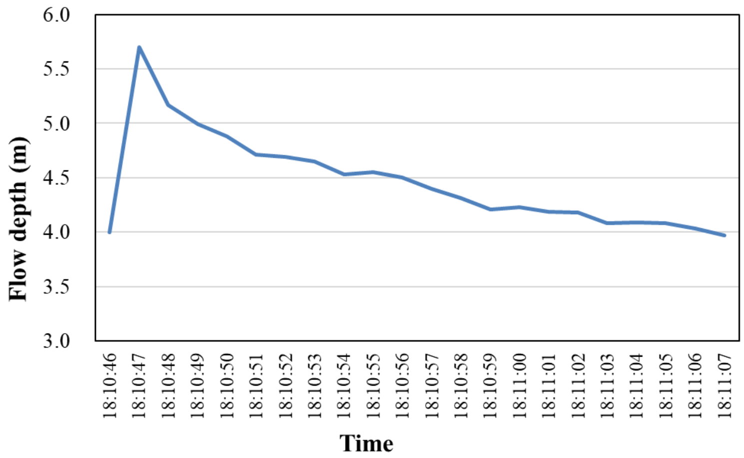
"The discharge, volume, sediment concentration, sediment volume, and sediment transport rate of debris-flow surge were determined based on the observational parameters. A rectangular channel cross section was assumed."

C5:L224: why $T/2$?

R5*:* The following figure shows the debris depth hydrograph, measured by an ultrasonic level meter, as a debris flow surge passes through the cross-section. The debris depth clearly exhibits a triangular shape, with H representing the maximum depth at the front (the apex of the triangle) in Equation (1). Given the peak depth H and surge duration T are known, the total discharge can be simplified as:

$$Q = \frac{1}{2} \times V \times B \times H$$

Therefore, when calculating the discharge for surge-type debris flows, the factor *T*/2 is applied.



Flow depth hydrograph measured by ultrasonic level meter as a debris flow surge passes through the cross-section on August 8, 2000 (http://dx.doi.org/10.12072/ncdc.ddfors.db6803.2025).

We have added this information in the revised manuscript (Page 10, Line 227-232):

"*Surge flow volume* W_c *(m³) was calculated as following:*

$$W_c = Q \times \frac{T}{2} \quad \textit{for surge flow} \tag{2}$$

$$W_c = Q \times T \quad \textit{for continuative flow} \tag{3}$$

where T is the record time (duration) of debris-flow surge (s), which is the time for surge front minus the time for surge rear. Flow depth hydrograph of surge flow exhibits a triangular shape, so the factor 1/2 is applied in the calculation."

C6:L225: please define how you differentiate surge and continuative flow

R6: We have added the definition in the revised manuscript (Page 4, Line 158-161):

"*These surges, known as surge flows, are characterized by a distinct head and body. Surge flows are typically separated by periods of flow interruption or quiescence. In contrast, when a debris flow persists for an extended period without noticeable surge features(such as a pronounced head), it is classified as a continuative flow.* "

C7:L230: what is r_s?

R7: We apologized for this typo. We have corrected it to γ_s (density of sediment), no new parameter is introduced.

C8:L234: I don't get the logic with the subscripts c and s. Why is sediment volume W_s, but sediment transport rate Q_c and not Q_s?

R8: In the history, the sediment transport rate Q_c was used in some published literature of our observation. To maintain consistency with this previously published literature, this symbol has been retained in this dataset.

C9: Figure 6: consider using other colors because in the previous figures you use these to differentiate surge types

R9: Thank you for your suggestion. We have redrawn the two figures as follows:

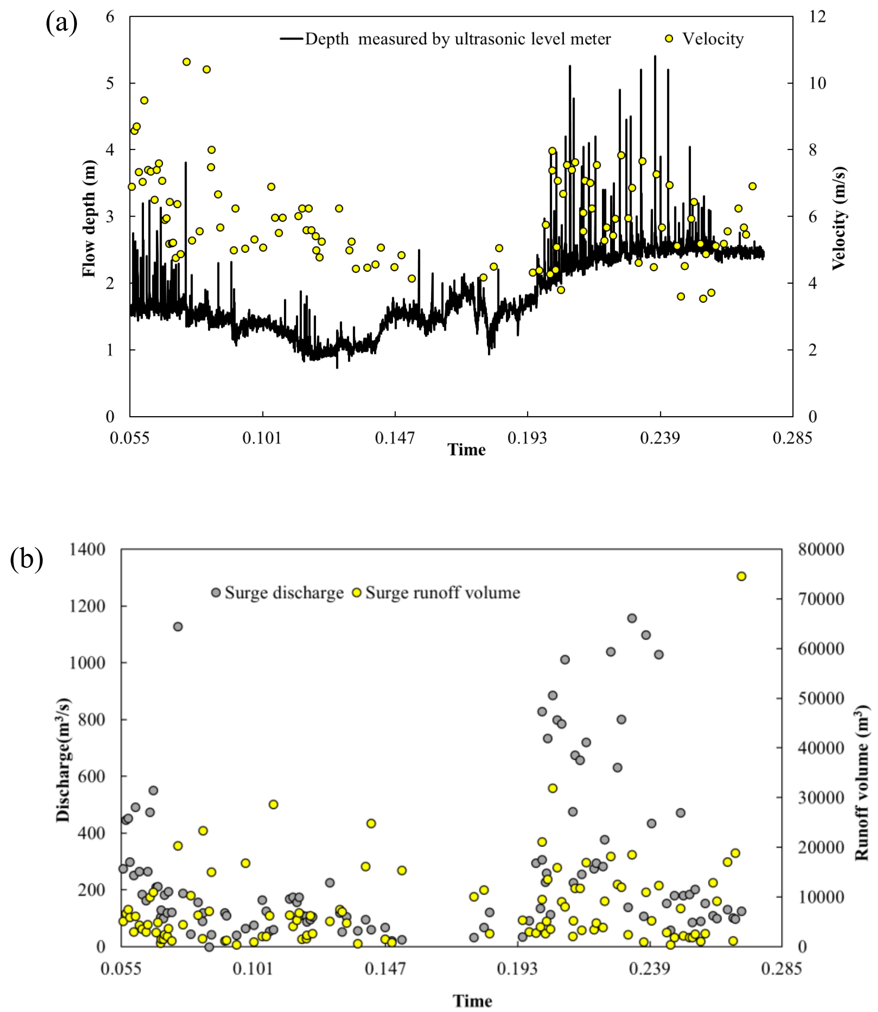


Figure 6. (a) Variation of flow depth, velocity and (b) discharge, volume of debris-flow surges occurred on July 16th, 1999.

C10: Figure 7: these are huge inter-annual variabilities and the catchment seems inactive now. Is this correct? Can this variability be explained with interruptions of systematic monitoring?

R10: 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.*"

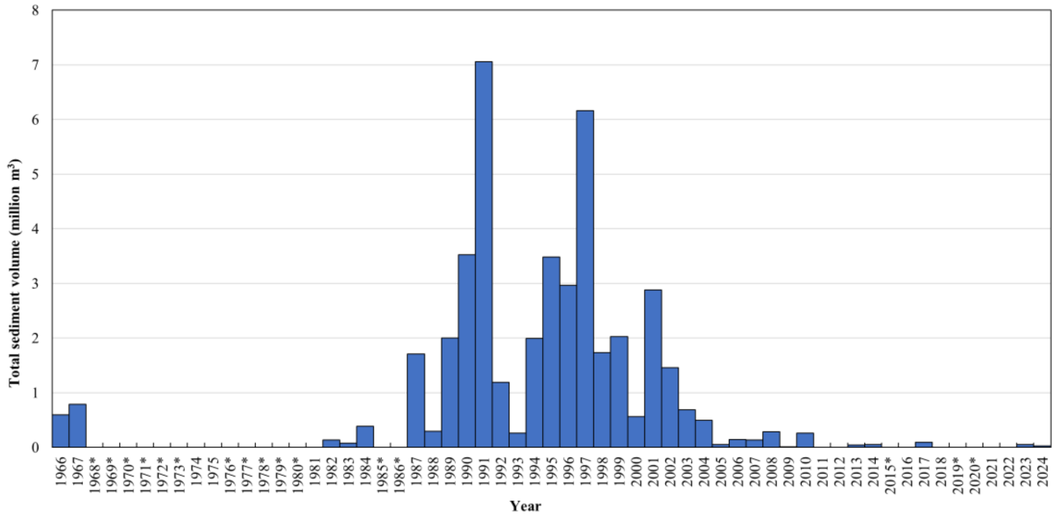


Figure 7. Variation of sediment transported by debris flow recorded from 1966 to 2024. * denotes debris flows occurred without observational data.

C11:L384: why is rainfall and meteorological data separated but still rainfall is mentioned here again?

R11: The meteorological data table for 1965 is sourced from a published dataset and primarily includes meteorological observation data, with only six days of rainfall data. To maintain consistency with the published data, the rainfall data was not deleted.

C12: Figure 12d/13/15: I understand that you want to show what your data looks like and this makes sense for data of debris flow events, but I don't think this is very informative for long-term meteo data. I would consider bar plots (like 12a) showing monthly mean and error bars with e.g. min/max values from your observation period.

R12: Long-term time series data would be more informative, but the figures presented in the manuscript only show short-term data. In fact, except rainfall, the meteorological and sediment concentration data in the dataset are relatively limited, making it difficult to construct statistical charts of long time series. Figure 12 has been revised according to your suggestions, and Figure 13b has been removed.

We also added the following description in the manuscript (Page 20, Line 388-391):

"The boxplot Fig. 13d illustrates the distribution of monthly rainfall throughout the year. Rainfall shows obvious seasonality, peaking during the rainy season (June to September) and reaching its lowest levels during the dry season (November to March)."

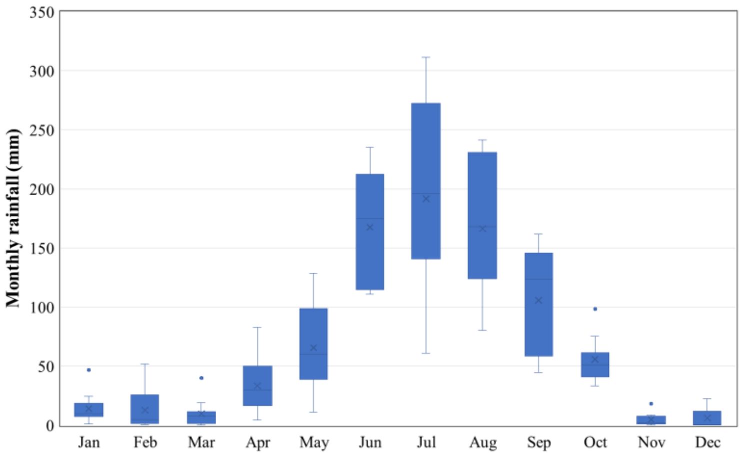
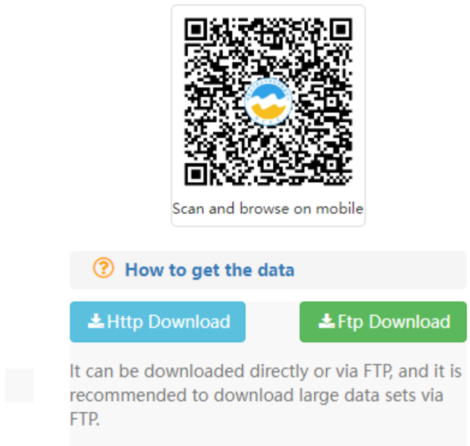


Figure 13. (d) statistical box plot of monthly rainfall at the Mayiping rain gauge (rainfall data are averaged over period 2013-2023). The points above the box plot denote extreme monthly rainfall.

C13: Data repositories: on the webpage in the box to the right « how to get the data » it says « download via FTP » instead of « http »

R13: All the data can be downloaded directly or via FTP. For large datasets, it is recommended to use FTP (as shown in the image below). Both download methods are available.



C14: Soil moisture of runoff plot at Jiangjia Ravine in 1966.xlsx: should relative water content be in unit g?

R14: The relative water content should be expressed in percentage (%). Our apology. We have corrected this in the table.

C15: Rainfall data: this seems to be in several data sets (meteorological, rainfall, kinematic). Maybe you could explain the differences in the text where you mention Table 3?

R15：As explained in our reply **R11**, the rainfall data (rainfall and debris flow data for 1961 and 1965) in the kinematic dataset were sourced from published paper-based (hard copy) datasets. To maintain consistency, these rainfall data were not removed.

In the meteorological dataset, rainfall was obtained through automated observations at weather stations. To preserve data integrity, the rainfall records remain included in the meteorological tables. The rainfall dataset primarily derives from rain gauges with minute-level resolution.