We are grateful to Leslie Hsu for her comments on the manuscript, and below, we give our replies to them.

Dear Editors and Authors,

This paper describes a very useful study that is relevant to the readers of ESurf. The authors build upon previous work in the growing field of seismic geomorphology and report a new dataset in a well-studied catchment. The techniques used in the study are still somewhat new to our community and the description of the methods and assumptions will be very useful to others who would like to do similar work. I am glad that there is a mix of seismologists and surface process scientists in the reviewer group, since I am not an expert in seismology. The methods seemed adequately described and referenced for others like me. The language and grammar are very adequate, my only recurring issue being that I found some paragraphs to be very long and have made some suggestions of where to split them to aid readers. Having the opportunity to read the previous reviewers' comments, I note my general agreement, as seen by slight overlap of some of my main suggestions below. I have some other minor comments that I think would add to the readers' comprehension and add relevant context.

(1) While reading the paper, it took a little extra effort to sort out the relationship between Pulse 1, 2, 3, and Rock 0, 1, 2, and the "12 other high frequency events" (p. 14 line 3). I think it would be extremely useful to have some sort of a summary table that lists timeline, relationships, and other values in some sort of standardized/normalized way, so that the reader can compare them quickly and review them after reading the detailed text in Section 4.

Things to compare in a table: - Each event and their timing/proposed relationship to each other - Velocity of the events - there is a range of velocities given in the text and a figure, but can value be given to the three separate pulses (and other events) in some comparable way? (fig 8a in tabular form - I find it difficult to visualize slope as velocity, and would need a protractor to get the +/- values) - energy (fig 8b in tabular form) - in situ monitoring values (section 5.2, Fig 9 in tabular format) - very brief comment of qualitative or inferred things about the event (inferences of geomorphic processes from the seismic data)

One advantage of this type of reporting is that it allows each characteristic of all events in this paper to be compared quickly, and not only with each other but with any other existing or future studies, which I think would be very useful.

The seismic metrics of a pulse propagating in the channel are not comparable with the metrics of the hillslope processes. For hillslope events we can give timing and location, but not speed of motion. Moreover, we have not provided information about the seismic energy of hillslope events, because the relatively large attenuation distances preclude a robust conversion to source energy. For channel flows we give the flow pulse velocity between stations and the seismic energy recorded at a station, corrected for short-range attenuation. The relation between individual hillslope and channel events is discussed in text. The complexity and diversity of these relations, we think, is difficult to abstract in metrics or even brief textual summaries. However, in response to the referee's comments, and to easily extract the information contained in Figure 8, we propose to add in supplementary materials, the following table that summarizes the propagation velocity and measured seismic energy at stations for each channel flow pulse.

	Pulse Velocity ($m.s^{-1}$) at…			Seismic Energy (dB) at…		
	IGB01	IGB02	IGB09	IGB01	IGB02	IGB09
Pulse 1	Ø	1.49	3.61	-97.6 ±0.5	-75.7 ±2.4	-91.4 ±3.3
Pulse 2	Ø	1.07	3.17	-97.4 ±0.5	-74.0 ±2.4	-79.0 ±3.3
Pulse 3	4.45	1.13	3.43	-91.1 ±0.5	-75.1 ±2.4	-79.9 ±3.3

(2) Some additional data were mentioned for this catchment, but not reported. In particular, it was mentioned that there is video recorded here, does the video support the conclusions/inferences drawn from the seismology? I know the video is probably very limited in location, but comparison of the three pulses in the same location of the channel could be very instructive. Is the video available? If not perhaps a simple explanation as to why. Are there other data for comparison such as velocity of the flow front as sensed from existing instruments that existed prior to this study?

There is a video camera that, when triggered, records the passage of debris flows at CD29. In the events reported here, the video (1 picture per second) showed the elevation of the flow height as indicated by the flow height dataset (Fig. 9c), but we did not observe additional information that could help to decipher the bedload concentration as shown by the impact rate dataset (Fig. 9d). For these flow pulses, other, independent observations of the flow front velocity along the stream were not made. Text stating this has been added to the manuscript (3rd paragraph of section 5.3 “Comparison with *in situ* monitoring”).

(2) Not being a seismologist, I tended to prefer more explanation or references for the data processing. In most cases there is a reference given. Is there a reference for the spreading of seismic waves techniques? (Section 5.2)

Theoretical formulations for the attenuation of seismic waves can be found in most seismological books (e.g., Aki and Richards, 1980). This reference has been included in the revised manuscript. They refer to geometrical spreading and attenuation of the seismic amplitude with the travelled distance (dependent of the wave content) and anelastic attenuation, dependent on the frequency content and the lithology.

(3) Discussion: There was not much comparison with the other detailed studies that the authors have done. For example, it would be nice to have a few sentences comparison to the 2013 JGR study, and how this one was similar or different. It seems that different topics were emphasized, but a brief handling with things like “Fluvial masking of hillslope signals was not a factor as we considered in Burtin et al. 2013 because… ” etc. would help to place this study in context of the existing literature.

The fluvial seismic signal, or more appropriate, the debris flow induced seismic signal does not affect the detection of hillslope processes because the stations deployed around the catchment does not record it, as it can be seen from IGB05 (Fig. 2c) and IGB07 (Fig. 3b). Text has been added to cover this observation (2nd paragraph of section 4.1 “Seismic signals and sources in the Illgraben”).

(4) I would like to bring up the point about accompanying data. The paper by itself more than satisfies the current practices for publication. Recently, investigators are being asked to provide more of their processed data in some accessible archive, but this understandably takes a lot of time, and there should be agreement among investigators about what is feasible and reasonable and useful. I copy some pieces from the current eSurf data policy: eSurf Copernicus Publications recommends depositing data that correspond to journal articles in reliable data repositories, assigning digital object identifiers, and properly citing a data set as a proper citation.
...and more at http://www.earth-surface-dynamics.net/general_information/data_policy.html
I don’t propose an answer to exactly what needs to be submitted to a repository, because it is a difficult question, I don’t want to add any unfair burden to the investigator, and also I don’t have an answer. However, I would like to open the discussion: for these unique, hard-earned datasets that could possibly be reused (AND cited) for other analyses, would the community be willing to share these data (in either raw, semi-processed, derived, or other form) with the wider community in a persistent database and adequately documented for reuse, after the original authors have published their initial findings?

I ask because I can't help wondering: what about the rest of the data for "up to 100 days" that the seismometers recorded? How many other days were candidates? This day must have been the best, but by how far? How many other events were there? Will those other events be analyzed too? Will the data be available for others to try to analyze it? To what extent could coarse fronts or other pulses be sensed? Was rainfall itself detectable from the seismometers? The authors could either briefly address these questions or if the data were made available, curious readers could take a look themselves.
The referee makes a laudable point about sharing of data and we fully agree that more eyes are better. However, we are currently pursuing further work with the 2011 data additional seismic data acquired during the summer 2013. With these experiments, we recorded at least 10 debris-flow or flood events that will help to understand how and where they initiate and what is the relevance of rainfall in such mechanisms. Until we have mined the data to our satisfaction, we will desist from public posting.

Other Minor things to consider:

(6) Fig 2 : Rain gauges 1-3 were averaged to make the plot, wondering how much variability there was in the different gauges? Sometimes there is great variability from the valley to the ridge, or in other localized parts of a catchment. Is there evidence of that here?
During the studied rainstorm, the spatial and temporal variability of rainfall was not important. Figure R1 shows the 10-min rainfall at each rain gauge: the timing and the intensity of the convective storm were coherent in the Illgraben catchment. Text has been added to cover this observation in section 2.3 "Rainfall record".

(7) Figures 2 and 3: This information is in the caption, but it might make is very clear to the readers if instruments 02 and 05 are labeled "channel" and "hillslope" in the actual figure panels. Same with figure 3 for channel vs. hillslope locations.
We have modified the figures in the revised manuscript, as suggested.

(8) Figure 6 minor wording change could make relationships clearer to reader, something like: "The likely location of mass wasting events related to pulse 3: Rock 1 (red), Rock 2 (green) and pulse 2 trigger event Rock 0 (blue),
We have modified the caption in the revised manuscript, as suggested.

(9) Figure 7: legend explaining that triangles are stations. This is obvious if all figures are seen but good for each figure to be self-contained.
We have modified the caption in the revised manuscript.

(10) There are a couple places where paragraphs get really long, over 20 lines, I find papers to be more readable shorter paragraphs. Some places to consider splitting long paragraphs (might require slight rewording): p. 4 (line 15), 5 (line 13), 10 (line 14), 11 (line 12), 15 (line 26), 18 (?)
We have split all the paragraphs that were mentioned above with the exception of p. 10, which refers to the section 3.2 "Event location method". The splitting of this paragraph is difficult to justify.

Figures

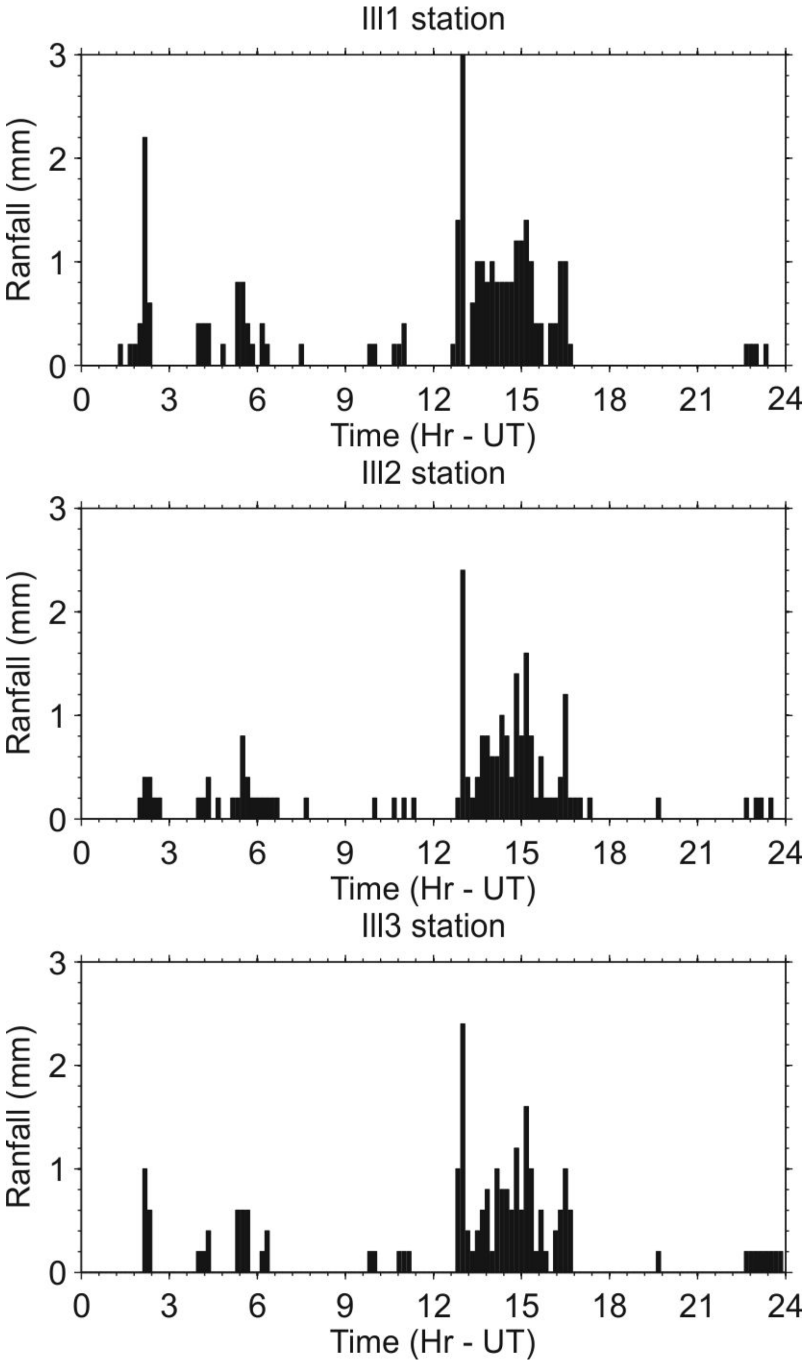

Figure R1: 10-min rainfall intensities recorded in the Illgraben catchment at rain gauges ILL1, ILL2 and ILL3 (from top to bottom) on July 13, 2011.