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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Formation time and mean movement velocities of the 7 August Zhouqu debris flows extracted from broadband seismic records" *by* Z. Li et al.

Anonymous Referee #2

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With interest I read a manuscript devoted to demonstrating the benefits of seismic monitoring of debris flow process and studying event characteristics, such as the formation time and the movement velocity. Overall, it looks good, but there are several places where I think a bit more explanation is needed. And there is also a number of grammar/wording problems. Please try to get a native English speaker to read any passages you need to rewrite. More detailed comments are below.

General comments (1) In general, the "Doppler effect" illustrate the pulse radiated in the same direction as the mass movement is relatively high in amplitude and compressed in time (higher frequency), while that radiated in the reverse direction of mass move-

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ment is low in amplitude and elongated in time (lower frequency). The authors only present the main frequency band in horizontal components much higher than the vertical component, probably due to the Doppler effect (Page 680, Lines 13-20). If Doppler effect is true, the amplitude in the horizontal components should be also larger than vertical component. How about the amplitude of seismic signals in such frequency band? There is no amplitude information in the results of time-by-time normalized spectrogram. Are the frequency bands determined by eye (red dashed lines in Figure 3)? Explain how the frequency bands were determined (mathematical fit I think is better). There are perhaps more such questions, the reader may want to find explored by the authors. I suggest that connection of the higher frequency band in horizontal components with the Doppler effect should be discussed with more care. There is no obvious first order relationship.

(2) Such a Short-Term Average / Long-Term Average (STA/LTA) approach is widely used in seismology. This detection algorithm consists in the analysis of the ratio between the average of the absolute seismic signal over a short- and long-time window, around 1 s and [100-500] s, respectively. If the STA/LTA ratio exceeds a defined threshold for at least a given duration, the corresponding time series is associated with an event. The authors present the threshold and time-window length of 1.6 and 15 s, respectively (Page 681, Lines 11-13). How were the threshold value and time-window length chosen? These parameters I think are crucial values in determining the start time for vertical, E-W and N-S components. I suggest conducting a set of tests to investigate the influence of these values, especially to examine how the threshold value influence for determining the start time. I also found the claim of the authors the results of start time could be used for alert systems (Page 684, Lines 24-26) quite premature and would like this aspect to be downplayed.

(3) There are many weak statements in the manuscript (Page 681, Line 8; Page 682, Line 10; caption of Figure 3). I think these statements need to be more strongly backed up. “rough” is not particularly strong of a statement. More detail analyses are neces-

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sary.

Specific comments (1) Methodology and results (Page 681, Lines 19-21): Not that clear to me. Could you somehow quantify this statement in spectrograms of Figure 3? It is better to understand that you mentioned in the manuscript.

(2) Methodology and results (Page 682, Lines 3-5): The sentences are a bit awkwardly written, perhaps they can be written more clearly. Explain more clearly here what are "the mean amplitude increasing velocities. . ."

(3) Methodology and results (Page 683, Lines 24-26): The error on time interval and runout distance is expected to be the error on estimations of movement velocity. One sentence to provide a description of possible error in estimating the mean velocities (9.2 and 9.7 m/s) would be helpful I think. This is very important information for "Discussions" section (Page 685, Lines 5-8).

(4) Discussions (Page 684, Lines 2-17): I think this paragraph can be deleted which is not really important in "Discussions" section. Non-normalized spectrogram can provide clear energy distribution in both frequency and time domains before and after event occurring time. Ideally, both Non-normalized spectrogram and time-by-time normalized spectrograms can be combined to provide a robust and complete time-frequency analysis of seismic signals. If you still want to put this paragraph (Page 684, Lines 2-17), I would suggest making it shorter.

(5) Discussions (Page 684, Line 27): The values of 0, 22.64 and 61.22

(6) Conclusions: This section seems to repeat a lot of "Introduction" section. Please try to be more succinct and add more conclusions (not only "summary").

(7) References: Digital Object Identifier (DOI) should be included: Example (Page 687, Lines 9-11) Chen, C.-H., Chao, W.-A., Wu, Y.-M., Zhao, L., Chen, Y.-G., Ho, W.-Y., Lin, T.-L., Kuo, K.-H., and Chang, J.-M.: A seismological study of landquakes using a real-time broad-band seismic network, Geophys. J. Int., 194, 885-898,

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doi:10.1093/gji/ggt121, 2013.

Thus, I suggest this manuscript can be published after a major revision.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 675, 2015.