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Earth Surface Dynamics Discussions
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Interactive comment on "Validity, precision and limitations of seismic rockfall monitoring" *by* Michael Dietze et al.

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Main Text:

The detection of extremely small events is impressive and exciting. Good work on the locations - this is admitted difficult with a fractured surface and a moving source.

P. 3 Line 16: Describe the characteristic frequency content in more detail (there is some discussion later, this may suffice, but I was wondering about it early on)

P. 6 Line 29: Zimmer and Sitar 2015 may be a better reference for this close-range work (<1km) than Zimmer 2012 (at 6+ km) - V.L. Zimmer, N. Sitar / Engineering Geology 193 (2015) 49–60

P. 7 Line 16-17: "signal, i.e., several seconds rise time of the signal from background,

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Discussion paper

followed by a long decay into background noise after reaching a maximum amplitude" The 2012 paper dealt with a very large event at distance: smaller events did not always have the same signal (see Zimmer and Sitar 2015)

P. 7 Lines 30-35: It's a little unclear how this method works, especially with a moving source - as you note below, the rocks are moving roughly vertically down the slope. It might be interesting in a future work to use this method for segments of the single and create a set of temporal correlations that together show the path? I'm not sure how this would work, but it would be interesting?

Table 1 - delta Pmax pre and post optimization: I'm not sure I understand what happens during optimization. Figure 7 looks like you have great location results, but this table seems to show that there was an iterative processing that eliminated some seismic locations and chose others based on additional evidence (e.g. TLS). Can you elaborate or make this a bit clearer? (this is explained later in the text)

P. 11 Lines 9: Is the 5-15 Hz (progressively decreasing signal) correlated with river baseline flow patterns (e.g. fluctuations in river flow due to increased evapotranspiration during the daytime?) Correlations of seismic/acoustic noise with river flow is hard to do, so it would be an interesting result if your instruments were sensitive to this.

P. 11 Line 14: I love this "Swiss trains always run on time". However, always is misspelled "alyways".

P. 11-13 and Figure 4 (environmental noise): I think this is one of the more interesting challenges to discriminating rockfalls from other sources (working toward automatic event detection). Good job identifying other sources and applying rejection criteria (including multi-station detection) to get down to 500 events, and then further confirming the identity of many of those spurious events.

Section 5.3 and 5.4: It took a bit of reading to understand the velocity estimate and the location methodology. The assumption is that the waves are arriving on a relatively

direct path, but if they are not (if there is weathering, sheeting joints, and variable velocities), it may explain some of the location deviation from seismic-only methods. (Also the valley floor probably has a substantially lower velocity - accounting for that may significantly shrink your location polygons in the cases when Pmax extends to the valley floor- e.g. event 1 and events 6-8). Nevertheless, the fact that you were able to localize such small and mobile seismic sources to the degree that you did is impressive.

P. 19 Line 18: could some of the shift to lower frequencies be attributed to overall lower energy release and higher proportional attenuation of higher frequency signals? E.g. with less energy, the high frequency portion of the signal is too low to be detected above ambient noise?

P. 20 Line 17: sensu stricto, not sensu strictu?

Supplemental material: I tested the supplemental material, and ultimately got it working on my Windows machine (but not my old Mac). Except for the DEM portion (I did not download a DEM), it all worked as promised. Some minor challenges that I noted:

Eseis needs: Version 3.3 of R or later (I have an old computer which can't use Version 3.3, are there older versions?)

Eseis on Windows needs to be installed from your webpage - some of the compiled files aren't readable by Windows, but I did manage to make it all work!

Eseis on Windows also needs Rtools

On Mac, (Error: Don't know how to decompress files with extension 17.1), might be related to Version 3.2 of R (unresolved)

What data format and resolution does the DEM need to be in? USGS DEM raster?

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