Interactive comment on 'Testing Seismic Amplitude Location (ASL) for Rapid Debris Flow Detection at Illgraben, Switzerland' by Fabian Walter et al.

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This work is a retrospective test of debris flow detection at a Swiss catchment (Illgraben) using time-averaged seismic amplitudes of data archived from a temporary seismic network. The study tests this technique on a small debris flow, and compares the results against data collected from permanent instrumentation at Illgraben. In addition, the technique was run on a 10-day period during which there were no debris flow, to check for robustness and false alarms.

Since Illgraben already has an automatic real-time debris flow monitoring system, the goal of the study is to determine if the 'seismic amplitude source location (ASL)' might provide advantages over that current system.

As applied by the authors at Illgraben, the technique is comparable to those used by other studies of debris flow detection, as well as volcanic tremor and pyroclastic flow detection and location at volcanoes. Debris flow detection is important to populations in alpine and volcanic regions. The technique has been shown to have promise but has not been fully developed (at least to my knowledge). The small number of good case studies make this one worthy of publication.

Technical queries and observations:

Body wave vs surface wave: the findings in Burtin et al that body wave dispersion fit the data better (if I understand that finding correctly) seem curious, given that debris flows are inherently a surface phenomenon. I look forward to your future work exploring the body wave vs surface wave question.

P10, L 20 – Since Table 2 shows that your Guralp 6TD's have a frequency response from 1-100 Hz, I'm puzzled by your selection of a butterworth filter edge at 0.5 Hz. In order to keep your analysis in the linear part of the seismometer response curve, shouldn't you filter it above 1Hz? Maybe 2Hz?

P11, L11-22, and Figure 10 – This 10-minute detection time lag at CD24 with respect to the geophone detection is interesting and important. 10 minutes is a long time for this example. Is there a volumetric component to the discrepancy? Is the ASL method detecting something like a volumetric centroid of the flow? If so, and if the flow front is just an un-energetic watery flow it is still a useful detection for hazard mitigation.

Following this theme, if a public alarm is to be disseminated as soon as possible, one would surely use the detection at or around CD1, where the discrepancy between the two systems is not great.

Figure 10, Section 5.3 – It seems possible that the lack of success using ASL to detect short-lived rock falls using short time windows may not be a good reason to avoid them for debris flows. For example, Kumagai et al (2009) used a 5-second window. Why the difference? It appears that your results using a 30-second window were similar to the 100-second window. Did you try a shorter window? Can you discuss that a little more?

Minor editorial suggestions:

P1,L15 – change ‘torrents in short time.’ to ‘torrents in a short time.’

P7, L15 – change ‘only few stations of the seismic network’ to ‘only a few stations of the seismic network’

P8, L15-20, and Figure 6- it’s not clear but it looks like a typo may have been made (station IGB3?). IGB09 does not have a very high amplitude, despite P8, L16.