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

* Location method The method used in this study is certainly valid and well described. But I'm curious to know why the authors did not use the same method (SSA, source scanning algorithm) as in their 2013 JGR paper? There are two classes of antenna methods to locate seismic events: 1- measure time delays by cross-correlation of seismic waveforms (as in the present work) or of envelopes (Burtin et al 2009), then search for location and velocity that minimize time residuals. 2- beam-forming methods, such as the SSA method (Burtin et al 2013) or methods that maximize cross-correlation of signals migrated in time (Almendros et al, GJI 1999; Lacroix and Helmstetter, BSSA 2011). Did you also try beam-forming methods? Could you justify your choice of the cross-correlation method?

For the study of geomorphic processes in the Chenyoulan catchment (Burtin et al., 2013), we tested the cross-correlation of seismic signals and also envelops but the time delays were often incoherent through the array and many events could not be located. We chose to test another approach introduced by Kao and Shan (GJI, 2004) and adapted to landslides (Kao et al., Landslides, 2012, doi:10.1007/s10346-012-0322-z). This method was for the Chenyoulan seismic dataset more consistent than the cross-correlation techniques. In the case of the Illgraben catchment, we did not explore the use of other methods since the easier cross-correlation analysis was giving coherent results. Another interest here is that the computation time in the cross-correlation method is shorter than in the SSA approach, according to comparisons from the previous study. We addressed this comment in the revised manuscript (1st paragraph of section 3.2 "Event location method").

* Comparison between seismic signal (Figure 9). Several additional mechanisms may explain the weak correlation between seismic energy and flow depth First, the seismic station is located 400 m upstream from CD29, so that the propagation time between the 2 stations is about 2 mn (if the flow velocity is 3-4 m/s). This partly explains the time delay between seismic energy and flow depth. Second, the seismic sensor can detect the debris flow before it reaches the sensor. This explains the progressive increase of seismic energy with time, compared to the sharp rise of flow depth. This effect may even be used to estimate the propagation velocity, assuming we know the attenuation of seismic energy with distance. The timing of the three pulses could be added in Fig 9, as done in Fig 3.

We agree that the distance between the seismic station IGB09 and the check dam CD29 (400 m) explains the time delay that is noticed between the recorded seismic energy and the flow height or the bedload impact rate. This is highlighted in the 1st paragraph of section 5.3 "Comparison with *in situ* monitoring". We also agree that the seismic sensors can detect the debris flow before it reaches the station. This is noted in section 4.2, earlier in the manuscript, but we have stressed it again in the discussion of data from IGB09 and CD29. However, in this section, our interpretations and comparisons are focused on the amplitude of flow pulses, bedload impacts and the spectral variations in the seismic signal with an abstraction of the time delay (with a zero-lag time offset). We trust that the referee found these interpretations acceptable.

* Rockfall volume and total volume of sediments: It would be interesting to have estimates of debris volume, and to quantify the importance of rockfall volume compared with other sources of materials. Could you estimate total volume of debris from observations of flow depths? seismic energy? Or from videos? You only mention in the conclusion that "long-term surveys should include independent constrains on slope activity like laser scanning to calibrate the conversion from measured seismic energy to mass of rock or sediment displaced." Some researchers have already published relations between the magnitude of the seismic signal and the volume (Deparis et al 2008, Dammeier et al 2011). You could use

these relations to estimate rockfall volume from magnitude, and use recorded local earthquakes to calibrate a magnitude-distance-amplitude relation. But there is a lot of spread in the data shown in these studies, with only a weak correlation between volume and magnitude

We have used the energy-volume relationship from Dammeier et al. (2011) (calculated volume for "Rock 1" is ~ 40 m^3). However, this method may not be appropriate for our study. First, the expected volume for the rockfall was probably smaller (< 10^3 m^3) than the ones used to determine the law. Field observations during maintenance of the seismic stations did not reveal major topographic changes in the affected slope, making the occurrence of a major event of more than 10^3 m^3 unlikely. Second, Dammeier's relationship was determined from the seismic signal at the nearest station (1-25 km) and without correction for seismic attenuation. This introduces considerable scatter in the data set, and reduces the interest of application to our case. We are acutely aware of the importance of attenuation and do not want to proceed without knowledge of local attenuation patterns and strengths, which we do not have. Third, the seismic data from the Swiss seismic network were corrected by the station amplification factor that is unknown in our case.