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# Deriving sediment transport information from debris-flow impact force signals

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Runoff-generated debris flow has hazardous implications for downstream communities and infrastructure in alpine landscapes. Our understanding of fluid mechanisms of debris flows is very limited, in part, by a lack of direct observations and measurements. Seismic ground motion-based observations provide new constraints on debris flow physics, but it is still not widely applied due to the missing of validated inversion models for interpreting the impact force which generates seismic ground motion. Here we propose a physical model for the high-frequency spectral distribution of impact force signal generated by debris flows. Then we present a new inversion model based on the physical model for the impact force signal and apply this to the devastating debris flows in Dongchuang, China, on 25 August 2004. The amplitude and frequency characteristics of the impact force data can enable the estimation of grain size, sediment concentration, and sediment flux. Results suggest that in-situ data from three sensors could have provided a reconstruction of sediment flux profile in the vertical direction. Meanwhile, an inversion model designed for debris flows impact force would potentially provide hydrodynamics information as well.