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Contribution of aftershock-induced landslides to erosion (by the example of Chuya earthquake (M=7.3) Gorny Altay, Russia)

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Seismic activity causes seismodislocations of different types and plays important role in modern relief formation. Seismogravitational dislocations such as landslides and rockfalls triggered by earthquakes bring the main contribution in transformation of the earth surface. At the same time the most considerable part of hillside material is moved by the main shock. But aftershocks also trigger landslides and rockfalls.

We calculated the contribution of aftershock-induced landslides - V_A to the total volume of landslides triggered by the main shock - V_{LT}, using the Guttenberg-Richter distribution and correlation between V_{LT} and earthquake magnitude M [Malamud, 2004]:

$$\frac{V_A}{V_{LT}} = \frac{b}{1.42 - b} \cdot 10^{-1.42 \cdot \Delta M}. \quad (1)$$

This contribution strongly depends on typical difference between magnitudes of the earthquake and the main aftershock. In case of Chuya earthquake 2003 (Gorny Altay, Russia) $\Delta M = 0.6$, and so $V_A/V_{LT} = 22\%$. We tested ratio (1) in two ways. First of all by using information about aftershocks activated by this earthquake in a fixed time period and then comparing information published by different seismological world centers about magnitudes of main shock and 2 largest aftershocks.

Supposing the same mechanism of seismic activations for paleoearthquakes and Chuya earthquake we can suggest the regional coefficient$\alpha = 1.2$, which takes proper account of the contribution of aftershock-induced landslides into erosion.

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