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Fractality of grain composition of debris flows

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Debris flows in essence are the process of mass transportation controlled by the constitution featured by a wide-ranged distribution of grain size. Debris-flow samples of different densities collected from different regions and gullies reveal that cumulative curve of grain composition, in particular for debris flows of high density, $\rho_s > 2 \text{ g/cm}^3$, can be fitted well by exponential function with exponents varying with regions and gullies. Debris flows fall into a narrow-valued domain of the exponent, as evidenced by Jiangjiagou Gully (JJG) with high occurrence frequency of debris flows. Furthermore, fractality of grain composition and porosity have been derived from cumulative curves in a certain size range, a range that determines the upper limit of grains constituting the matrix of debris flows. One can conclude that fractal structure of porosity plays crucial roles in soil fluidization that initiates debris flows, and debris flows occur at some range of fractal dimension, in coincidence with field observations.

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