



## **Physiographic controls on the magnitude frequency distribution of shallow landslides.**

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We examine more closely the physiographic controls primarily responsible for the magnitude frequency distribution of shallow landslides, including the famous rollover effect. Debris slides and debris flows are often caused by precipitation events and earthquakes resulting in highly mobile sediment transport. Landslide size is a function of their mobility, their point of initiation, and the major physiographic constraints within the landscape. Examining populations of landslides, we find initially that they tend to larger sizes, typically initiating in steep mid and upper slopes and traveling to the valley floor or beyond. Based on the morphometrics of each particular watershed, however, opportunities for successively larger landslides diminish rapidly, and beyond a limiting size, the landslide magnitude frequency curve decays rapidly as a power law. The rollover is therefore an inflection point between two fundamental physiographic controls: slope and landslide mobility as a minimum size limiter, and slope distance and relief as a maximum size limiter. Landslides in the region of the rollover are important to predict as they have considerable impact to denudation and are, reasonably close to the work peak. We draw on examples from actual landslide populations in Coastal BC, Venezuela and California, and modelled landslides using CARLA, a cellular automata regional landslide analysis tool. Finally, we consider the utility of incorporating this information into a Risk Analysis for a given watershed.