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# Size-frequency distribution of landslide-dammed lakes from a simulation approach

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The scaling of events in geomorphology relates the magnitude of an event to its frequency. The size-frequency distributions of landslides have been found to follow a power-law scaling. However, the scaling of lakes formed by the deposition of landslides in the river bed received less attention. In this study, we simulate landslide occurrence, their runouts and the resulting lakes and observe that landslide-dammed lakes also follow a power-law scaling, although the scaling relationship of the landslides does not predict the scaling of the landslide-dammed lakes. A rollover is present in both distribution, and its location depends on the resolution of the topographic input data.

We find that cumulative density plots are the most appropriate to highlight the influence of glacial imprint on landslide scaling, and that fluvial landscapes present results following more closely the power-law scaling. However, since lake volume is influenced by valley shape, and can be inferred from drainage area as well as landslide size, its scaling cannot be directly explained by glacial imprint and landslide scaling.

Thus, among the 8 mountain ranges investigated, the Southern Alps of New Zealand and the Tibetan Plateau of Wenchuan present similar distributions with a high amount of big lakes (> $10^8$ $m^3$), while the Central Mountain Range of Taiwan exhibit a similar pattern to the Canadian Rockies and European Alps. The Japanese Alps, Mendoza Andes and Cordillera de Talamanca present much smaller lakes.