

## Relationship between rainfall condition and landslide magnitude-frequency in Japan

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Rainfall-induced landslides are important natural hazards that often inflict substantial damage to society. For assessing landslide hazards, a basic task is to understand the relation between historical landslide records and rainfall conditions. Although critical rainfall thresholds have been established in this context, little is known about the size characteristics of the resulting slope failures. This study examines potential correlations between landslide size distributions and total rainfall (mm), mean rainfall intensity (mm/h), maximum rainfall intensity (mm/h), or rainfall duration (h). We analyzed 4,848 rainfall-induced landslides that occurred throughout Japan during 2001 to 2011. We classified these landslides into two groups according to their estimated volume, and tested whether their size distribution is related to rainfall characteristics.

Results show that the frequency of small landslides surpasses that of large landslides at low values of total rainfall, mean rainfall intensity, and maximum rainfall intensity. In contrast, the frequency of large landslides increases with increases in these rainfall parameters. The cross-over values are the total rainfall of 200 - 270 mm, mean rainfall intensity of 3.5 - 3.8 mm/h, and the maximum rainfall intensity of 33 - 45 mm/h. With regard to the rainfall duration, the frequency distribution of large landslides is almost the same as that of small landslides. These results suggest that the total rainfall and the rainfall intensity affect landslide magnitude more than rainfall duration in the Japanese archipelago.

Keywords: landslide, magnitude-frequency, rainfall