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Topographic characteristics of rainfall triggered landslides from a newly compiled set of inventories

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Landslides triggered by rainfall or seismic activity are a significant source of loss of life and property damage in mountainous regions. In these settings, it is critical to plan development and infrastructure to avoid impact from landslides. To do so, it is necessary to have a clear understanding of the topographic characteristics of areas both where landslides are initially triggered but also the down-slope areas where debris and bedrock fragments are deposited. Recent research has investigated the characteristics of landslide locations triggered by seismic motion, providing guidelines about the most hazardous parts of a given landscape. In this contribution, we report on a set of analyses conducted on a large compilation of landslide inventories associated with major rainfall events around the world. This compilation includes a number of previously published inventories together with 6 newly mapped inventories of landslides created using high-resolution imagery and machine learning techniques. To our knowledge, together these form the most comprehensive compilation of rainfall triggered landslide inventories gathered to date.

We analyse a number of topographic characteristics associated with these landslides using the 30m resolution SRTM DEM, including local slope, average upstream slope, relief, topographic roughness, wetness index, and topographic position index. We analyse these parameters for both the scar of the landslide as well as the area of deposition. While there is significant dispersion across inventories for several of these parameters, there are consistent relationships between landslide likelihood and roughness, slope, and wetness index. Although the relationships identified with slope and roughness are consistent with prior work, the relationship between wetness index and landslide likelihood suggests that the calculation of wetness index from topography alone may not effectively represent the saturation state of the hillslopes. We anticipate that these findings could be useful for other regional and global landslide modelling studies and local calibration of landslide susceptibility assessment.