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A comparative rainfall threshold study for the initiation of landslides in parts of West Sikkim, Indian Himalaya

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Rainfall is the primary cause of landslides in the Indian Himalayan Region. As a result, it is crucial to learn how precipitation is connected to the onset of landslides. The precipitation level over which landslides begin is a critical factor. An attempt is made in this study to establish the rainfall threshold at which landslides become likely in the Geyzing weather station region of the Sikkim Himalaya. The study's main objective is to evaluate and contrast several threshold models to identify the most appropriate one for the region under examination. Antecedent rainfall, intensity-duration (I-D), accumulative rainfall-duration (E-D), intensity-date (I-date), and accumulative rainfall-date (E-date) were used as thresholds in the present investigation. The India Meteorological Department of the Indian government provided the data on the average daily rainfall. The information on landslides was gathered from the Sikkim State Disaster Management Authority, Government of Sikkim, India, including the exact date of the event. The current analysis examined rainfall data collected over a period of eight years, from 2011 to 2018. Within a 9-kilometer radius of the Geyzing rain gauze station, data on 19 landslides were gathered, including their precise locations, dates of occurrence, and affected areas. The intensity duration approach has the highest reliability index (about 95% accuracy) of the methods tested. According to the intensity-duration technique, the threshold for precipitation that could cause a landslide in the study area was determined to be an average of 16.95 mm per day. Similarly, a landslide will occur once it has rained for 38.9 mm over the course of three days, as found by the three-day antecedent rainfall threshold study. Ordinary kriging, a popular form of interpolation, provided additional support for the study with an accuracy of 66.1%. Studies of this nature can greatly aid in providing early warning and reducing the severity of any resulting landslide damage.