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# Regional scale debris flow susceptibility mapping in Barla Mountains (NW Taurus), Türkiye

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As in many high mountainous regions of the world, Türkiye is also a country heavily affected by landslides. Considering that Turkey has the highest number of landslide-related deaths in Europe (14 per year), debris flows also have a devastating impact on the southern part of the country. On July 13, 1995, a debris flow killed 74 people and destroyed 180 houses in Senirkent District in Barla Mountain. Barla Mountain, where physical weathering is predominantly effective on widespread limestone, exhibits mainly arid/semi-arid climatic conditions. After the 1995 event, check dams were built within the scope of debris flow prevention. This study aims to perform susceptibility analyses of debris flow hazard using a spatially distributed empirical model (Flow-r) on the northern slopes of the Barla Mountain Belt.

All sub-catchments along the Barla Mountain Belt where the model was applied were afforested to mitigate debris flows. The Flow-r model consists of two stages: identifying potential source areas and calculating areas that could be affected by debris flows using flow direction algorithms. Potential debris flow source points and a digital elevation model with a spatial resolution of 5 m were used as model inputs. Model results were calibrated in each basin through reports of previous debris flow events (for Senirkent), aerial photographs, and field observations. Regarding the study's results, 7°-15 m/s model output was determined as the worst-case scenario, and 6°-17 m/s model output was determined as the extreme scenario. Through the field observations, physical weathering and debris production continued at elevations higher than the timberline depending on lithology and climate, and we observed that the check dams were filled with debris. According to the validation results of the Flow-R model we performed at this site, the accuracy, precision, and positive predictive power are 87.78%, 46.45%, and 23.03%, respectively. As a result of the study, considering the complex structure of debris flows, regional-scale debris flow susceptibility maps were produced with minimum data requirements and short computation times, and a primary source was provided in pre-disaster risk management studies. In the Barla Mountain, our findings identified differential weathering variations of limestone lithologies attributes and substantial debris generation as factors contributing to areas with a discriminating likelihood of debris flows under worst-case scenarios. Furthermore, the results of the model supported by the field observations revealed that the check dams in the region have lost their functionality. Moreover, on hillslopes subjected to afforestation, our findings indicated that the model's predicted spread areas did not align with historical debris flow occurrences.