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Towards Nationwide Probabilistic Mapping of Slow-Moving Landslides in Turkey Using InSAR

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Interferometric Synthetic Aperture Radar (InSAR) is widely used for detecting slow-moving landslides due to its high spatial resolution and millimeter-level accuracy over large areas. However, the computational demands of processing SAR data have hindered the development of national-wide slow-moving landslide inventories for many mountainous regions worldwide. This study examines a probabilistic approach to identify hillslope deformation anomalies as proxies for slow-moving landslide locations. We generated surface deformation data for the southeastern region of Türkiye, leveraging the high coherence of Sentinel-1 SAR imagery in areas with sparse vegetation cover. On the basis of the InSAR-derived hillslope deformation spatiotemporal pattern, a modeling framework inspired by extreme value theory will be developed. This will feature a suite of topographic, seismic, anthropogenic, and climatic variables. The model aims at predicting surface deformation and calculating the exceedance probability above a threshold suitable for classifying slow-moving hillslopes. After training, the objective is to transfer the model to the entirety of Türkiye to identify hillslopes exhibiting significant surface deformation and locate potential slow-moving landslides. This protocol will lay the foundation for advancing landslide hazard assessments and guiding further risk investigations.