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Harnessing new tools and satellite products to support landslide forecasting and capacity building over High Mountain Asia

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The Hindu Kush-Himalaya (HKH) is one of the greatest geologically fragile young mountain systems in the world and are highly vulnerable to landslides. Extreme rainfall, seismic activity and human interventions result in landslides and related hazards that cause severe economic losses each year and can cause hundreds of fatalities annually. Effective response, mitigation and planning for landslide impacts is often challenging due to limited information on historical landslide behavior, land surface characteristics, impacts, and triggering processes. High resolution and publicly available satellite data, Earth system models, and machine learning approaches can provide enhanced understanding of where and when landslides impact the HKH and importantly how these patterns may change in the future. Several efforts led by NASA, including the High Mountain Asia program and the SERVIR program have enabled new datasets, models, and capabilities to support both scientific advancement and capacity building activities within this region in terms of cascading hazards and their impacts. This work leverages a global and regional modeling approach called the Landslide Hazard Assessment for Situational Awareness (LHASA) as well as a machine-learning driven algorithm for identifying landslides called the Semi-Automatic Landslide Detection (SALaD) to bridge spatial and temporal scales for improved situational awareness of landslide hazards. Building upon several downscaled, regionally focused near real-time and forecasted precipitation information, this work also presents an initial assessment of changing patterns of potential landslide hazard across this region considering the past several decades and looking to the end of the 21st century. Through harnessing open source tools and data products available for HKH, this work demonstrates the potential for improving situational awareness and characterization of landslide hazards within the regional context at daily to decadal scales. Working closely with regional stakeholders, these capabilities will inform emergency response and planning on the ground as well as provide context for possible future mitigation needs.