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Towards A Global Landslide Forecast

Sana Khan[1,2], Dalia B. Kirschbaum[1], Thomas Stanley[1,3], Pukar Amatya[1,3], and Robert Emberson[1,3]
[1]NASA Goddard Space Flight Center, Greenbelt, Maryland, USA (sana.khan@nasa.gov)
[2]Earth System Science Interdisciplinary Center, College Park, Maryland, USA
[3]Universities Space Research Association, Columbia, Maryland, USA

Numerical weather models are used in a variety of applications, including a growing body of landslide hazard assessment models. Heretofore, these applications have not included global landslide forecasts but this remains an important gap in better understanding the future spatiotemporal impact that landslides can have on populations and infrastructure. We explore the feasibility of using a precipitation forecast within the Landslide Hazard Assessment for Situational Awareness (LHASA) v2.0 model, which is designed to provide estimates of potential landslide hazard for rainfall triggers. Data on precipitation, soil moisture, and snow mass is available from NASA's Goddard Earth Observing System Forward Processing product (GEOS-FP), which provides global scale products in both forecast and assimilation modes. These variables are incorporated into the LHASA Forecast model by replacing satellite rainfall estimates from the Integrated Multi-satellitE Retrievals for Global Precipitation Measurement (IMERG) with forecasted rainfall from GEOS-FP. The LHASA Forecast model also uses soil moisture and snow mass estimates from GEOS-FP rather than soil moisture and snow mass data from the Soil Moisture Active-Passive (SMAP) level 4 product. The LHASA Forecast model was run retrospectively at a daily scale with forecasted precipitation with up to a 3 day lead time. Results are compared with the LHASA v2.0 model that uses SMAP and IMERG data. Analysis of the LHASA Forecast system was conducted in several different ways. First, performance was assessed with categorical and continuous statics to determine how closely the forecasted probabilities match that of the LHASA v2.0 nowcast landslide probabilities. The outputs of LHASA v2.0 and LHASA Forecast are also compared for several high impact rainfall events that triggered landslides to determine the skill in identifying the potential high hazard areas. Preliminary results suggest that for large precipitation events (e.g. tropical storms), the same general hazard areas are identified; however, this can vary largely by geography and precipitation regime, owing to differences in spatial resolution and phase errors of the forecasted precipitation. This presentation outlines the preliminary work to address forecasted landslide hazard globally and discusses next steps towards improving landslide forecast skill.