Assessing the viability of using GEOS-Forecast Product for Landslides Forecasting
A step towards Early Warning Systems

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Rationale

Landslides across the globe are mostly triggered by extreme rainfall events affecting infrastructure, transportation and livelihoods. Forecasting potential landslide activity and impacts can be achieved through reliable precipitation forecast models. However, it is challenging because of the temporal and spatial variability of precipitation, an important factor in triggering landslides. Evaluation of the precipitation field, associated errors, and sampling uncertainties is integral for development of efficient and reliable landslide forecasting and early warning systems. This study develops a methodology to assess the viability of using a precipitation field provided by a global model and its potential integration in the landslide forecasting system. The study focuses on the comparison between the IMERG (Integrated Multi-satelled Reanalysis for Global Precipitation Mission) and GEOS (NASA Goddard Earth Observing System)-Forecast product over contiguous United States (CONUS) against a radar-based gauge corrected and quality controlled reference i.e. MRMS (Multi-Radar Multi-Sensor).

Methodology

Dataset:
GPM-IMERG Early V06 Level-3 (0.25°/1hr/Global)
GEOS Forecast (H00) (0.25°×0.31°/30min/Global)
Reference: MRMS (0.1°×0.5°/30min/CONUS)

Study Period: July 2018 – February 2020
Study area: CONUS

Results

- Correlation between IMERG Early and MRMS is overall high except for the west coast and northeast where GEOS Forecast show relatively better correlation.
- For landslides hazard and no-hazard zones, the PDFs and CDFs are similar across the three products, albeit slight variation for IMERG Early and MRMS at 20–40mm rainfall accumulations
- IMERG Early has a good ability of detecting precipitation in Appalachian Region in Winter for high rainfall thresholds (≥100mm) i.e. ~60% of the times MRMS detects rain, IMERG early agrees
- GEOS Forecast is promising in forecasting rare downslopes (triggering landslides), showing temporal coherence with the ground truth, albeit with seasonal and regional variation.

Conclusions

- The correlation between IMERG Early and MRMS is overall high except for west coast and northeast where GEOS Forecast show relatively better correlation.
- For landslides hazard and no-hazard zones, the PDFs and CDFs are similar across the three products, albeit slight variation for IMERG Early and MRMS at 20–40mm rainfall accumulations.
- IMERG Early has a good ability of detecting precipitation in Appalachian Region in Winter for high rainfall thresholds (≥100mm) i.e. ~60% of the times MRMS detects rain, IMERG early agrees.
- GEOS Forecast is promising in forecasting rare downslopes (triggering landslides), showing temporal coherence with the ground truth, albeit with seasonal and regional variation.

References

- https://gmao.gsfc.nasa.gov/radar herramienta predictiva/