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Performance of satellite-based products in forecasting landslides triggered by heavy rainfall events in Italy

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In Italy, heavy rainfall events often have significant consequences. Such events may trigger landslides, which frequently cause severe socio-economic damage.
Here, we analyze satellite-based rainfall products to evaluate their capability in forecasting the spatio-temporal occurrence of landslides induced by heavy rainfall. Three different satellite rainfall estimates are used: 1) the Tropical Rainfall Measurement Mission Multi-satellite Precipitation Analysis, TMPA, real time product (3B42-RT), 2) the SM2RASC product obtained from the application of SM2RAIN algorithm to the Advanced SCATterometer (ASCAT) derived satellite soil moisture data, and 3) the Climate Prediction Center (CPC) Morphing Technique (CMORPH). An automatic tool is used to reconstruct distinct rainfall events from satellite-based data. Three classes of events, “Heavy”, “Heavy/Torrential”, and “Torrential”, are identified and selected, based on the maximum cumulated rainfall in 24 h. Then, exploiting a historic catalogue of failures occurred in Italy from 2008 to 2017 rainfall events responsible for the observed landslides are extracted in the three classes. Most (85%) of the selected events related to landslides are used to define rainfall thresholds. The remaining (15%) events with landslides and all the events not related to landslide occurrences are used to assess the threshold performance through skill scores and receiver operating characteristic (ROC) analysis.