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Towards real-time global assessment of post-fire debris flow hazards with remotely sensed data

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As the risk of wildfires increases worldwide, burned steeplands are vulnerable to the secondary hazard of widespread sediment mobilization through debris flows. Following an initial burn, sediment and soil previously restrained by vegetation are no longer consolidated, allowing for easy mobilization into channels and along steep hillslopes through runoff. Sufficiently powerful rainfall incorporates entrained material into turbulent flows and serves as the primary trigger for debris flow initiation. There is thus an ongoing need to establish the relationship between rainfall and debris flow initiation based on a variety of spatiotemporal preconditions. Previous work establishes regional and local thresholds to constrain the effect of rainfall in recently burned areas, but no empirical or numerical solution has worldwide application. Building from regionally-based efforts in the U.S., this work considers how remote sensing data can be applied to better approximate the post-fire debris flow hazards worldwide using freely available global datasets and software. Our work assesses the utility of remote sensing resources for analyzing burn characteristics, topography, rainfall intensity/duration, and, thus, debris flow initiation. Early results show that global observations are sufficient to delineate background rainfall rates from storms likely to cause debris flows across a variety of burn severity and topographic conditions. However, the dearth of publicly-available post-fire debris flow inventories globally limit the ability to test how the model framework performs within different climatologic and morphologic areas. This work will present preliminary analysis over the Western United States and demonstrate the feasibility of a global, near-real time model to provide situational awareness of potential hazards within recently burned areas worldwide. Future work will also consider how global or regional precipitation forecasts may increase the lead time for improved early warning of these hazards.