A data-driven approach to identifying post-fire landslide triggers
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Abstract. Wildfire can alter the hydrologic and geomorphic response of watersheds, resulting in a
cascade of increased hazard for floods, sedimentation, shallow landslides, and debris flows. This fire-
flood sequence has been studied in detail in regions like Southern California where landscape evolution is
driven by a pattern of such events. In spite of this attention, most landslide inventories cover limited
regions and timeframes, presenting a challenge for transferring knowledge on triggering mechanisms for
mass movement hazards across multiple regions. In this study, we use the NASA Global Landslide
Catalog in conjunction with large-scale remotely sensed gridded precipitation and fire datasets for
comparing the hydrologic conditions preceding 6041 landslides that occurred in 120 countries between
2000 and 2019. We use a Mann-Whitney test to compare the relative precipitation prior to the landslides
with randomly selected samples from the same location and time of year. We find that post-fire landslides
are generally preceded by smaller precipitation events relative to landslides not associated with fire.
Furthermore, post-fire landslides tend to occur earlier in the wet season, suggesting that fire increases
susceptibility to rainfall-driven landslide in a variety of climates. Finally, we present a discussion of the
seasonal and spatial differences in landslide triggers.