



What rainfall events trigger landslides on the West Coast US?

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A dataset of landslide occurrences compiled by collating google news reports covers 9 full years of data. We show that, while this compilation cannot provide consistent and widespread monitoring everywhere, it is adequate to capture the distribution of events in the major urban areas of the West Coast US and it can be used to provide a quantitative relationship between landslides and rainfall events.

The case of the Seattle metropolitan area is presented as an example. The landslide dataset shows a clear seasonality in landslide occurrence, corresponding to the seasonality of rainfall, modified by the accumulation of soil moisture as winter progresses. Interannual variability of landslide occurrences is also linked to interannual variability of monthly rainfall. In most instances, landslides are clustered on consecutive days or at least within the same pentad and correspond to days of large rainfall accumulation at the regional scale. A joint analysis of the landslide data and of the high-resolution PRISM daily rainfall accumulation shows that on days when landslides occurred, the distribution of rainfall was shifted, with rainfall accumulation higher than 10mm/day being more common. Accumulations above 50mm/day much increase the probability of landslides, including the possibility of a major landslide event (one with multiple landslides in a day).

The synoptic meteorological conditions associated with these major events show a mid-tropospheric ridge to the south of the target area steering a surface low and bringing enhanced precipitable water towards the Pacific North West. The interaction of the low-level flow with the local orography results in instances of a strong Puget Sound Convergence Zone, with widespread rainfall accumulation above 30mm/day and localized maxima as high as 100mm/day or more.