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Characterising extreme rainfall over mountain regions with a network of tipping bucket rain gauges and GPM satellite data

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Mountain regions such as the Andes and the Himalayas are a hotspot of natural hazards. Many of them, in particular floods, landslides, and soil degradation, are related to extreme rainfall events. However, characterising rainfall is complicated by the extreme spatiotemporal gradients, and the scarcity of in situ observations. Characterising extreme rainfall events is particularly problematic because most existing rainfall records are only available at a low temporal resolution (daily or coarser). Here, we analyse records of a network of 77 tipping bucket rain gauges located in Ecuador, Peru, Bolivia and Nepal, with a data availability ranging between 1 and 10 years.

From the raw data we derive rainfall intensities at 5 and 10 minute intervals using composite cubic spline interpolation and smoothing. We then compare those intensities with instantaneous measurements from the Global Precipitation Measurement (GPM) satellite mission. Although correlations are generally low, it is possible to find significant trends that make it possible to interpolate the observed intensities in space, and to generate rainfall intensity quantile maps for the wider high Andean region.

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