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# Extreme value analysis of short remotely-sensed precipitation datasets

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Extreme value (EV) analysis of remotely-sensed precipitation fields is a challenging problem due to the short record length of the datasets available, and the inevitable presence of measurement errors especially for intense rainfall rates. Despite their limitations, remote sensing estimates offer unique insight into the hydrological cycle at the global scale, and their space-time resolution makes available unprecedented information for hydrological applications. Here we develop and apply new statistical tools specifically designed to improve the estimation of extreme rainfall frequency based on short datasets from remote sensing sources. In particular we focus on precipitation estimates obtained by merging retrievals from multiple satellite-borne sensors, such as those in the Tropical Rainfall Measuring Mission (TRMM) and the Global Precipitation Measurement (GPM) mission. We describe a downscaling technique that can be used to connect key statistical properties of the rainfall fields obtained from satellite measurements at the daily aggregation time scale to those observed at the rain-gauge scale. The spatial correlation function, the intermittency structure, and the probability distribution function of rainfall intensities are downscaled from the satellite grid scale to the point scale, such that they can be meaningfully compared with the same quantities from observational records at single rain gauges at the ground. The donwscaled quantities are then used to define the Metastatistical Extreme Value distribution, and thus estimate average recurrence intervals of extreme events at the point scale. Here we present the application and testing of this combined methodology, and show that it can improve the estimation of extreme events in locations where long rainfall records at the ground are not available, which is the case for vast poorly gauged areas around the globe.