# Daily extremes from global rainfall datasets compared to estimates from buoy networks through MEVD-based downscaling

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Estimating the frequency of extreme precipitation events, both locally and over extended areas, is key for developing risk reduction measures in present and future climates. Large areas of the world are characterized by sparse or absent rain-gauge networks, which poses significant challenges to the estimation of extreme events in many applications. Remote sensing and reanalysis results may contribute to filling some of these gaps, but suffer from significant uncertainties and their use meets at least two important obstacles: 1) remote sensing/reanalysis rainfall estimates are defined at coarse resolutions, thereby preventing direct validations against ground observations, and 2) they usually span a ~20-year observation period, making it difficult to estimate the frequency of large extremes. Using the novel Metastatistical Extreme Value Distribution (MEVD) and a recent statistical downscaling technique, we compare ground and satellite-based/model estimates of rainfall to quantify the improvement achieved through downscaling in high-quantile quantification. We focus on ocean rainfall observations, which are rarely considered in validating global databases, from the Tao-Triton, Pirata, and Rama buoy networks. We quantify the estimation uncertainty for point extremes associated with several widely used rainfall datasets, such as IMERG v6, MSWEP2, CMORPH 1.0, SM2RAIN, GSMAP, CHIRPS, ERA-5. We find that the MEVD-based extreme value downscaling approach generally improves point extreme estimates.