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Quasi-global extreme rainfall intensity derived from the Tropical Rainfall Measurement Mission

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The frequency, magnitude and duration of precipitation extremes are closely dependent on climate change and variability. While recent works suggest an ongoing increase of extreme climate events, a comparison between past and actual maxima rainfall intensities across the world is necessary. Previous compilations of the world's greatest rainfall depths are based on rain gauges sparsely located on the global terrestrial surface with significant gaps in remote continental regions and oceans.

Unlike rain gauges and weather radars which provide extreme precipitation estimates at the micro- and mesoscale respectively, new remote sensing techniques offer now the possibility of monitoring precipitation over tropical and temperate regions across the world. Also, for the first time, such tools allow to detect rainfall extreme values over oceanic regions.

This work provides a comparison between the world's greatest rainfall depths from point measurements in climatological stations during the 20th century (WMO, 1994) and those derived by the Tropical Rainfall Measurement Mission (TRMM) satellite with a 0.25° x 0.25° resolution grid from 1998 until 2013. During this 15 year observational period, global maxima rainfall depths associated to durations ranging between 3 hours and 2 years were estimated. A scaling law and functional form of maxima rainfall over continents and oceans provided for the first time a quasi-global assessment of the temporal and spatial distribution of the most intense rainfall events. In particular, the results show that (1) all the rain gauge-based measurements over the past century exceed the satellite-based values during last 15 years, and (2) the majority of hotspots with maximum rainfall intensity are located in the oceans.