



## **Intensity-Duration-Frequency curves at the global scale**

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Intensity-Duration-Frequency (IDF) curves usefully quantify extreme precipitation. Unfortunately, sparse, infrequent or short observations hinder the creation of robust IDF curves in many locations around the world. We present a global, multi-temporal (1 to 360 h) dataset of Gumbel parameters at 30 km resolution named PXR-2 (Parametrized eXtreme Rain). Using these data we show that the two Gumbel parameters typically scale robustly with event duration ( $r^2 > 0.85$ ,  $p < 0.01$ ). Thus, we propose a four-parameter IDF formula that allows estimates of rainfall intensity for a continuous range of durations, and describe the PXR-4 dataset that compiles these parameters. This parameter scaling property opens the door to estimating sub-daily IDF from daily records. We evaluate this characteristic for selected global cities and a rain gauge network in the United Kingdom. PXR aims to be of immediate use for engineers for designing critical infrastructure such as urban drainage systems, dams and highways, with potential applications in other fields of earth sciences.