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Extreme Precipitation Return Levels on a Global Scale

Ruud van der Ent (1,2,3), Gaby Gründemann (1), Hylke Beck (4), Marc Schleiss (5), and Nick van de Giesen (1)

(1) Department of Water Management, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, Netherlands, (2) Department of Physical Geography, Faculty of Geosciences, Utrecht University, Utrecht, Netherlands, (3) Water Research Centre, School of Civil and Environmental Engineering, University of New South Wales, Sydney, Australia, (4) Department of Civil and Environmental Engineering, Princeton University, Princeton, USA, (5) Department of Geoscience and Remote Sensing, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Delft, Netherlands

Understanding the magnitude and frequency of extreme precipitation events is a core component of translating climate observations to planning and engineering design. Classical statistical methods, such as the Generalized Extreme Value (GEV) distribution and Generalized Pareto Distribution (GPD), estimate precipitation extremes using annual maxima and peak over threshold respectively. This research also implements the innovative Metastatistical Extreme Value distribution (MEV) that, due to the inclusion of ordinary precipitation events, may provide a better and more reliable basis for prediction the estimation of the extremes. The three methods are applied at a global scale using the Multi-Source Weighted-Ensemble Precipitation (MSWEP-V2, coverage 1979-2017 at 0.1 arc degree resolution) . The global scale application of methods allows analysis of the complete spatial patterns of the extremes. The MEV method generates a relatively smoothened spatial pattern for extremes, as this method is less sensitive to local extremes. The GEV method on the other hand is highly sensitive to local extremes and the shape parameter shows unrealistic high spatial variability. The generated database of precipitation extremes for high return periods provides is particularly relevant in otherwise data-sparse regions to provide a benchmark for local engineers and planners.