Global analysis of extreme precipitation trends and examination of the extreme value distribution based on daily data over land for the time period between 1988 and 2013

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Studying changes of climate extremes has become more important due to the impact of such events on the environment and societies worldwide. The Full Data Daily (FDD) dataset provided by the Global Precipitation Climatology Centre (GPCC) was used to investigate the spatial and temporal variability and development of extreme precipitation events between 1988 and 2013 by means of precipitation related ETCCDIs. The results are compared with those from the CMORPH dataset in order to assess the reliability of the obtained FDD based diagnostics.

Most striking are decreases in the duration, intensity and frequency of extreme events in Central Africa (tropical regions). Further decreasing trends in extreme events are found for the northern coasts of the Gulf of Mexico, southern Chile, many European coastal regions and south-south-east China. Extreme precipitation has increased significantly in amount, intensity and frequency over north-west India and adjacent Pakistan, especially the northeast coastal regions of the Arabian Sea including those governed by the Indian Summer Monsoon. The amount, intensity and frequency of heavy precipitation have been also increasing in the Northeast of the USA, many parts of Mexico, many parts of the tropical rainforests in Brazil, Eastern Europe, northern and southern parts of Africa (subtropics), North-East Asia and northern Australia.

The behaviour of large but rare events that occur in the upper tail of the precipitation distribution was also investigated. Based on the Kolmogorov-Smirnov statistical test, the FDD analysis is tested against three characteristical distributions, namely the power law, the exponential and the log-normal distribution. The log-normal distribution fits the observations the best and the power law distribution the worst.