



Investigation on extreme runoff characteristics in major German river basins

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Identifying trends of extreme runoff characteristics is one of the major research areas in the contemporary hydrology. This is mainly because of the compelling evidence that the anthropogenic disruptions of the environment are significantly modifying the likelihood of occurrence of floods and droughts. Changes in the characteristics of extreme events may have both socioeconomic and environmental consequences. In Germany, for instance, major river basins have frequently experienced catastrophic floods and droughts situations leading to enormous losses during the last decades. The objective of this study is to identify changes and trends of extreme runoff characteristics in major German river basins during the last 60 years. Daily streamflow data from more than 200 runoff gauging stations obtained from EWA database were used to estimate extreme runoff characteristics. Among these characteristics were: specific volume, total duration and frequency of high flows, and cumulative specific deficit, total drought duration, and maximum drought intensity of low flows. The peak over threshold method (at threshold levels of 90, 95, 99th percentile of daily streamflow data), and the truncation level method (at truncation levels of 5, 10, 20th percentile of daily streamflow data) were used to derive high and low-flow characteristics, respectively. All these characteristics were systematically analyzed for winter and summer to better comprehend seasonal variability. Mann-Kendall and Spearman tests were conducted to detect either monotonically increasing or decreasing patterns whereas the Pettitt test was used for detecting change-points in the mean and variance of the extreme runoff characteristics. A bootstrap resampling process will be used to determine the field significance of the trend results. Results of this study agreed with recent findings regarding the positive trend (in winter) and the negative trend (in summer) of low flows across many rivers in Germany. We are currently investigating possible explanatory reasons for changes in extreme runoff characteristics.