IWRM2018-141
8th International Water Resources Management Conference of ICWRS

An assessment of temporal effect on extreme rainfall estimates

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In recent times, a number of studies have recognized the changes of observed rainfall in many parts of China, leading to the argument on climate change and its impact on extreme rainfall. However, it should be borne in mind to the concept of natural variations and the complex physical mechanism hidden in the observed data sets.

This study aims to investigate the issue further in terms of inter-decadal variability of extreme daily rainfall of stated return period relevant for hydrologic risk analysis. In particular, the study aims to address the following research questions:

Does climate change have a significant role in decadal quantile variability in Chinese context?
Do recent datasets really provide more reliable predictions of extreme rainfall to be used in design purposes?

In this study, we present a regional approach in region-of-influence (ROI) form for the assessment of changes in the frequency of rainfall at the selected regions of China. The ROI regional approach is appealing because it reduces the variability of the estimates and reflects the changes in a best possible manner. With this approach, a homogeneous pooling/regional group for particular decade is selected from gauged stations that are available in that particular decade and a frequency analysis is performed for a subject site. A decade consists of 10 annual maximum (AM) data points but with this approach a large number of AM data is available for that particular decade and due to this a reliable estimate could be achieved. This study uses the L-moments based Index-flood approach with the application of generalized extreme value (GEV) distribution to estimate the extreme rainfall.

Temporal effect on quantile estimates is aimed to obtain from different periods of record as follows:
- distinguishing between early and late halves of the record (pre 80s/industrial and post 80s/industrial) and
- distinguishing by decades, 1951 - 60, 1961 – 70, 1971 – 80, 1981 – 90, 1991 - 2000 and 2001 - 2010

Daily rainfall amounts at 753 stations across China are available. Among them, 45% have the records that span from 1950s to 2010. Initially, this study is conducted on the Yangtze and the Xijiang Basin.

So far the outcome of the analysis reveals that while there were small effects present indicating higher quantile values when estimated from data of the 1990s, it is felt not to be worthwhile to exclude the data of any decade from the extreme rainfall estimation process. A detained analysis with more relevant results will be presented in the conference paper.