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Quantile Regression Technique to Investigate the Rainfall Trend for Flooding and Drought Conditions

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Climate change is a principal cause in uncertainty in quantifying future water supply, thereby complicating water resources planning and management in river basins. Climate change affects surface water resources through time-variable rainfall and air temperature. There is an increase concern of the increasing or decreasing precipitation owing to global warming. In this study, the technique of linear quantile regression is utilized to investigate rainfall trend of the extreme events (flooding and drought). This method reveals a certain advantages over the tradition linear ordinary least-square techniques for the following reasons: the error terms are not necessary to be normally distributed, does not assume homoscedastic variables (variables could be heteroscedastic), It is not sensitive to outliers, It can be used to predicts a desired quantile of the conditional distribution rather than mean and this approach is preferred when the interest is the analysis of distribution rather than average and when the main attention is the tail of distributions.

The linear Quantile regression is employed in two regions: the Dee River catchment in the United Kingdom, where the daily rainfall data of 13 rain gauges were collected over the period of 1970-2004 and the Beijing metropolitan area in China for 22 rain gauges over period of 1950-2012. This technique is then conducted on the observed precipitation to examine the trend of both Flooding (represented by 95% quantile) and drought situation (5% quantile). It has been shown that the quantile regression is capable of revealing the patterns of flooding and drought without having to suffer from non-constant variance. The significance of the trend is verified using a null hypothesis for confidence levels of 95%.