



Simultaneous occurrences of floods in mesoscale catchments

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Floods in mesoscale catchments are often the result of intense precipitation of varying duration. The spatial extent of precipitation is linked to the extent of flooding. The simultaneous occurrence of floods in different medium size catchments is often the reason for large scale floods. The spatial behavior of extreme precipitation and discharge can be investigated using copulas and extreme indices. The relationship between intense precipitations measured at different locations depends on the large scale meteorological conditions. Depending on the geographic location and the dominating weather pattern certain catchments have frequent simultaneous extremes while others behave in a complementary fashion. The purpose of this work is to investigate the simultaneous and complementary occurrence of floods in catchments using copulas conditioned on atmospheric circulation patterns (CPs). Circulation patterns responsible for simultaneous floods are identified using areal precipitation and/or unusual discharge increases. Patterns are identified using a fuzzy rule based approach based on anomalies of the 700 hPa surfaces. The rules are formed by maximizing the explained variance under the assumption of simultaneous and complementary behavior. The conditional copulas are investigated for extreme behavior. Besides the traditional bivariate investigations higher dimensional dependences are investigated using an entropy based approach.