



Extreme events in Elbe's river catchment area and their associated circulation patterns

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This study focuses on analyzing the statistical behavior of Elbe river streamflow and the identification of the main circulation patterns associated with extreme events in Elbe's catchment area, on seasonal timescale. To identify the threshold, which defines an extreme event, we have made use of Peak over Threshold method and the 90% and 95% percentile.

The composite maps of sea level pressure anomalies, corresponding to the days when the discharge was above a certain threshold which differs from one season to another, were constructed. The main circulation patterns associated with these extreme events, which were derived from the composite map, were examined using k-means cluster analysis. Four distinct circulation patterns were identified for each specific season. In winter most of the extreme discharge events are associated a dipole-like pattern with a strong negative center over central Europe and extending over the southern part of Atlantic and a strong positive center over the northern part of Atlantic, which favors a north-easterly circulation. In summer, extreme events are triggered by a blocking like pattern over the Atlantic and a cyclonic circulation over the southern part of Europe, which carries humid air from the Baltic Sea over the northern part of Germany.

These findings imply that major floods in Elbe's catchment area are triggered by the occurrence of different circulation patterns, specific to each season in part.