



Estimation of return periods of multiple losses per winter associated with historical windstorm series over Germany

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During the last decades, several windstorm series hit Western Europe leading to large cumulative economic losses. Such storm series are an example of serial clustering of extreme cyclones and present a considerable risk for the insurance industry. Here, clustering of events and return periods of storm series for Germany are quantified based on potential losses using empirical models. Two reanalysis datasets and observations from 123 German Weather Service stations are considered for the winters 1981/1982 to 2010/2011. Based on these datasets, histograms of events exceeding selected return levels (1-, 2- and 5-year) are derived. Return periods of historical storm series are estimated based on the Poisson and the negative Binomial distribution. About 4680 years of global circulation model simulations forced with current climate conditions are analysed to provide a better assessment of historical return periods. Estimations differ between the considered distributions. Except for frequent and weak events, the return period estimates obtained with the Poisson distribution clearly deviate from empirical data. This clearly documents overdispersion in the loss data, thus indicating the clustering of potential loss events. Better assessments are achieved for the negative Binomial distribution, e.g. 34 to 53 years for the storm series like 1989/1990. The overdispersion (clustering) of potential loss events clearly states the importance of an adequate risk assessment of multiple events per winter for economical applications.