

Evolution of flood typology across Europe

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Following the frequent occurrence of severe flood events in different parts of Europe in the recent past, there has been a rise in interest in understanding the mechanisms by which the different events have been triggered and how they have been evolving over time. This study was carried out to establish the characteristics of observed flood events in the past across Europe in terms of their spatial extent and the processes leading up to the events using a process based hydrological model. To this end, daily discharge data from more than 750 stations of the Global Runoff Data Center were used to identify flood events at the stations based on a threshold method for the period 1961-2010. The identified events at the different stations were further analyzed to determine whether they form the same flood event, thereby delineating the spatial extent of the flood events. The pan-European hydrological model, E-HYPE, which runs at a daily time step, was employed to estimate a set of catchment hydrological and hydro-meteorological state variables that are relevant in the flood generating process for each of the identified spatially delineated flood events. A subsequent clustering of the events based on the simulated state variables, together with the spatial extent of the flood events, was used to identify the flood generating mechanism of each flood event. Four general flood generation mechanisms were identified: long-rain flood, short-rain flood, snowmelt flood, and rain-on-snow flood. A trend analysis was performed to investigate how the frequency of each of the flood types has changed over time. In order to investigate whether there is a regional and seasonal pattern in the dominant flood generating mechanisms, this analysis was performed separately for winter and summer seasons and three different regions of Europe: Northern, Western, and Eastern Europe. The results show a regional difference both in the dominant flood generating mechanism and the corresponding trends.