Future precipitation extremes during summer monsoon in southern Pakistan

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Extreme precipitation events are considered as a hydro-meteorological hazard resulting in colossal damage worldwide. In Pakistan, the extreme precipitation events have increased in the recent decades particularly in the southern part (Sindh province). This region did not receive substantial amount of precipitation earlier, but now experiencing urban flooding almost every year causing loss of life, property, crops and infrastructure. The region lacks the information regarding the recurrence of extreme precipitation events. Therefore, there is a strong need for a reliable information of extremes over the upcoming decades for better regional planning. Although statistical methods based on extreme value theory (EVT) are the most relevant ones to study the extremes, but they are never been applied in Pakistan. To address this shortcoming, we use the peak over threshold (POT) approach to compute the return levels (RLs) of precipitation extremes, and also identify the regions most prone to them. In this study, we analyzed the summer monsoon daily precipitation measured at nine weather stations of Pakistan Meteorological Department over the period 1980-2013. The summer monsoon (JJAS) is preferred for the analysis, because most of the extreme precipitation occurs during this period. We apply POT approach to model the daily precipitation above a selected threshold for each station. Then, we estimate return levels (RLs) of precipitation extremes during summer monsoon in southern Pakistan (Sindh) for the next 5, 25, 50 and 100-years. Lastly, we compare the 5-years with 100-years RLs to indicate the stations most vulnerable to precipitation extremes in future. This work is funded by the Climate KIC, European Institute of Innovation and Technology, Germany.