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Impact of Climate Change on Combined Flood and Drought events in India

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The drought and floods are a natural phenomenon of ecosystems. Many studies found that the frequency and intensity of individual events of floods and drought are increasing in recent decades due to climate change. However, it is still unclear whether the frequency of combined flood-drought events is increasing in the same year or not under the climate change scenario. To identify drought and flood characteristics, we used the Standardized Weighted Average of Precipitation (SWAP), and copula bivariate distribution concept to estimate the joint probabilities of combined flood-drought events of the same year. We utilized gridded rainfall data from the India Meteorological Department at 0.25 degree for the present study. We estimated drought, flood and combined flood-drought events for the base period (1901-1930) and the current period (1991-2018). The analysis demonstrates that about 51.97% of the total grid points show an increasing monthly SWAP values trend in the summer monsoon season. However, in winter, only 15.55% of the total grid points show an increase in the trend of monthly SWAP values. The univariate flood and drought analysis revealed that 83.98%, 83.98% and 81.90% of total grids show a significant percentage change of drought at 5, 10 and 25-year return periods, respectively when the current period is compared with the base period. Still, only, 27.88%, 16.32% and 13.82% of the total grids show a significant change in the flood 5-year, 10-year and 25-year return periods, respectively. We also found that combined flood-drought events' frequency increases in 39.21%, 36.49% and 20.71% of total grid points corresponding to 5, 10 and 25-year return period values, respectively. This study concluded that less intensity drought, flood, and combined flood-drought events are increasing in more grid points. The study outcomes will help the decision-makers to make efficient decision to overcome the impacts of the hydroclimatic extremes.