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Increasing flood risk in Africa: a climate signal?

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The economic damages caused by floods, as well as the number of people killed by them has substantially increased in recent decades on the African continent. The number of flood fatalities, in particular, has increased about one order of magnitude during the last 50 years. These figures call for urgent actions to reduce damages and casualties. To plan these actions, we first need to understand the reasons why flood risk has increased so dramatically in Africa. Flood risk can be defined as a combination of the flood probability and the potential adverse consequences. Hence, we investigated both the climatic signatures that may have increased flood probability, as well as the population changes that may have led to increased human vulnerability to extreme floods.

Given the global perception that the severity and frequency of floods has increased in recent years, we examined if these perceived trends are supported by observational data collected in Africa. In particular, we investigated trends in annual maximum discharge using a large, consistent and quality-assured database from 79 gauging stations in Africa. The related African river basins remain largely undisturbed and are representative of diverse hydro-climatic conditions. Hence, changes in their hydrological response may provide relevant information for detecting spatially and temporally averaged climatic conditions. Based on the results of both continental and at-site data analyses, we found that the frequency and magnitude of African floods have not significantly increased during the Twentieth Century, and that climate, overall, has not been a main factor in the observed increase of flood damages.

Having detected no significant climate signals, the study focused on flood vulnerability. The African continent, as well as many other areas around the world, has undergone widespread and intensive urbanization. During the last 50 years, while the total population has increased by a factor of 4, the urban population in Africa has increased by one order of magnitude; approximately the same as the increase of fatalities caused by floods. The study of population patterns at the continental scale showed that most of the recent deadly floods have happened where the population increases have been largest. At the local scale, we found numerous examples of increased human settlements in flood prone areas.

These results provide demonstrable evidence that intensive and unplanned urbanization, and the related population increase on floodplains has led to an increase in the potential adverse consequences of floods; particularly of the most serious and irreversible type of consequence, namely the loss of human lives.