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Floods in the Upper Niger Basin – An increasing threat under global change?

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Water scarcity is the dominating natural threat in most regions of West Africa. Therefore, hydrological research focuses mostly on droughts, while other natural hazards tend to be neglected. But as an increasing number of reports show, the lack of water often turns into the other extreme and heavy precipitation events cause severe floods as seen in Niger and Benin 2010, Togo 2007 or Mali 2011, 2008, 2007 and 2001. The consequences of droughts and floods depend on the magnitude of the event and on the other hand on the vulnerability of the population affected. In the case of West Africa, most studies agree that the vulnerability of the majority of the population will strongly increase under global change. Consequently floods will hit increasingly poor and vulnerable communities unable to adapt adequately. Concerning the magnitude of the hazards, most studies agree – despite the great uncertainty of climate projections in this region - that droughts will appear more often and more severe under climate change conditions. But in return, does that mean that the number and/or the magnitude of the floods in this region will decrease under drier climate conditions compared to the past?
We tackle this research question for the Upper Niger Basin with a differentiated climate trend analysis of reanalysis (WATCH) and modeled climate data and eco-hydrological modeling. Climate data of two dynamic Regional Climate Models (CCLM, REMO) are individually bias-corrected. The bias-corrected dynamic and one additional statistical (STAR) Regional are compared to IPCC-Global Climate Model data (ENSEMBLE) in order to classify their trends. Finally, we analyze the reanalyzed and projected climate data with an extreme value statistic to show the past and the range of the possible future development of heavy precipitation events.
In a second step, the climate data is used to drive the complex eco-hydrological model SWIM. The model is calibrated and validated with observed discharge data of several gauges in the river Niger. Since the climate data provides a broad range of future climate scenarios, we are able to model the range of flooding under different climate scenarios. An analysis of the results in terms of recurrence intervals and extent of floods may help to create a regionally differentiated risk assessment.