Simulating future trends in hydrological regime of a large Sudano-Sahelian catchment under climate change

D. Ruelland\textsuperscript{1}, L. Collet\textsuperscript{2}, S. Ardoin-Bardin\textsuperscript{3}, P. Roucou\textsuperscript{4}
\textsuperscript{1}CNRS, \textsuperscript{2}UM2, IRD, HydroSciences Laboratory, Montpellier, France; \textsuperscript{3}Climatology Research Centre, Dijon, France

Because of severe climatic changes over many decades, environmental and natural resources have evolved in West Africa. This study assesses the impact of future climate change on water flows at the outlet of the Bani watershed (Mali). Four general climate models (GCM) and one regional climate model (RCM) have been used to provide future climate scenarios over this area. Based on the SRES-A2 scenario, outputs from these climate models were used to generate daily rainfall and temperature series in the short, mid and long-term according to (i) the unbias and delta methods application and (ii) temporal and spatial downscaling. A simple temperature-based formula was used to calculate present and future PET. Both rainfall and PET daily series have been introduced into a conceptual, hydrological model (calibrated and validated over 1952–2000) to simulate future discharge. Results show that various future trends for water resources can be expected. Using the WRF RCM does not provide better results than GCMs. The CSIRO GCM is the most optimistic model (the simulated water volume is 10.5 times higher than with the others): it thus does not appear to be relevant as the simulated discharge values are out of the observed ranges. The ARPEGE GCM implies discharge comparable to the wet 1950-60s. The MPI-M and HadCM3 GCMs induce in the long-term water resources as scarce as in the 1970-80s. This latter trend would tend to reduce water resources if demographic pressure still increases, which would make the local populations more vulnerable.