EGU21-7992
https://doi.org/10.5194/egusphere-egu21-7992
EGU General Assembly 2021

Modelling hydrological droughts and floods in the Volta Basin, West Africa

Solomon Hailu Gebrechorkos[1], Ming Pan[2], Peirong Lin[2], David Pritchard[3], Nathan Forsythe[3], Hayley Fowler[3], and Justin Sheffield[1,2]

[1]School of Geography and Environmental Science, University of Southampton, United Kingdom of Great Britain – England, Scotland, Wales (s.h.gebrechorkos@soton.ac.uk)

[2]Department of Civil and Environmental Engineering, Princeton University, Princeton, New Jersey, USA

[3]School of Engineering, Newcastle University, Newcastle upon Tyne, United Kingdom

Hydrological extreme events such as droughts and floods have a wide range of impacts on society and sectors such as agriculture and energy production. The impact of these extremes are projected to increase with future climate change and there is an urgent need to develop adaptation measures to reduce and manage the impacts. Long-term analysis of hydrological extremes, using a combination of models and climate data, helps better plan and manage water resources under global change. In this study, we modelled and analyzed hydrological extremes of the Volta river basin at very high-resolution (>10000 river reaches) using the Variable Infiltration Capacity (VIC) hydrological model, the vector-based river network routing model (RAPID), and high-resolution meteorological forcing datasets. The output from the VIC model is evaluated at multiple time scales (daily to annual) and for extreme events (droughts and floods) using observed streamflow data during the period 1979-2013. The model performed very well in areas less affected by dams, with performance increasing from daily to annual time scale. The modelled streamflow data is used to assess changes and variability in droughts (duration days and severity) and floods (annual daily maximum). The results show a decreasing and increasing trend in moderate and severe droughts in northern-eastern and southern parts of the basin, respectively. An increasing trend in floods is observed in the upper part of the basin (Black and White Volta) and the main river of the Lower Volta and we found a strong correlation with changes in precipitation and soil moisture.