



## **Assessment of the potential of the coupled WRF-Hydro modeling system for flood forecasting in the Ouémé-river basin, Benin, West Africa**

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Since 2000s, most of West-African countries and particularly Benin have experienced an increased frequency of extreme flood events. In this study we focus on the case of the Ouémé-river basin in Benin for the period 2008-2010. To investigate on how to early warn these flood events, the coupled atmosphere-hydrology model system WRF-Hydro is selected. Such a coupled model allows to explore the contribution of atmospheric components into the flood event, and its ability to simulate and predict accurate streamflow. The potential of WRF-Hydro in correctly simulating streamflow in the Ouémé-river basin is assessed by forcing the model with operational analysis dataset from ECMWF. Atmospheric and land surface processes are resolved at a spatial resolution of 5km. The additional surface and subsurface water flow routing is computed at a resolution 1:10. Key parameters of the hydrological module of WRF-Hydro (REFKDT, SLOPE, RETDEPRTFAC, OVROUGHRTFAC, and MANN) are calibrated offline, and tested online with the coupled WRF-Hydro. The uncertainty of atmospheric modeling on coupled results is assessed with the stochastic kinetic-energy backscatter scheme (SKEBS) used with the WRF model. As results, WRF-Hydro is able to simulate the discharge in Ouémé river on offline mode with a Kling-Gupta Efficiency (KGE) of around 0.60. The use of precipitation dataset from the Tropical Rainfall Measuring Mission (TRMM) in offline mode reveals the sensitivity of modelled discharge to precipitation variability over the study area. A stochastic perturbation ensemble of 10 members for three rain seasons shows that the coupled model performance in terms of KGE is  $0.22 \pm 0.08$ . This ability in realistically reproducing observed discharge in the Ouémé-river basin shows that the coupled WRF-Hydro modeling system is suitable for future flood forecasting applications.