

## **Flood Forecasting over Lower Nzoia Sub-Basin in Kenya**

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### **ABSTRACT**

Real time flood forecasting is one of the most effective non- structural measures for flood management. In this study, Ensemble Kalman Filter (EnKF) is used with Probability Distributed Moisture model (PDM) to forecast flood events over Nzoia sub-basin. The performance of four variations of EnKF (state updating, parameter updating, dual (state parameter) and dual (parameter-state) updating) were evaluated using the Root Mean Square (RMSE) and Coefficient of Efficiency (CoE) for 1, 3, 6, 9 and 12-hour lead time forecasts. In 1EE01 gauging station, RMSE and CoE values was 30m<sup>3</sup>/s and 0.70 while 1EF01 station had RMSE and CoE values of 50m<sup>3</sup>/s and 0.82 respectively. For the state variables, standard deviation of 1.1, 0.32, 0.21 and 0.05 were found for recharge, surface storage, groundwater storage and storage respectively while for the PDM parameters, standard deviation of 4.0, 0.2 and 0.2 were found for maximum store capacity, exponent of recharge function and ground recharge time respectively. Parameter updating performed better in terms of RMSE and CoE and thus potential of improving flood forecasting to enable management of flood related risk on real time basis over the sub-basin.

**Key Words:** Discharge, rainfall, Ensemble Kalman Filter, flood forecasting, rainfall-runoff model.