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Operational flood forecasting using FGM model in Chindwin river basin, Myanmar

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The present research work deals with flood forecasting in Chindwin River basin which is situated in Northern West of Myanmar under available hydro-meteorological data. Flood is one of the natural disasters which occur in Myanmar every year. Flood forecasting and issues of flood warnings are the effective ways to reduce damages. The goal of the study has been to initiate operational flood forecasting. The catchment area covers 110350 km2 and it is divided into subcatchments.

This research applied Flussgebietsmodell (FGM) which is originally developed by the Institute of Hydrology and Water Resources Planning (IHW) of the University of Karlsruhe. FGM model is an event based rainfall-runoff model. It is based on the unit hydrograph as fundamental building element. The model has semi-distributed spatial structure to be applied on homogeneous units of a catchment. However, the model may also be applied in a lumped mode. In this study, it is considered in a lumped mode due to fewer rainfall gauge stations. Model parameters are runoff coefficient, unit hydrograph parameters and routing parameters. Unit hydrograph is determined using linear cascade model. The gross precipitation is subject to losses modelled through a loss or production function. The remaining effective precipitation is routed to the outlet through a linear transfer function that is assumed to be time invariant. Flood routing is done by Kalinin - Miljukov method.

The two important parameters, when predicting a flood hydrograph, are the magnitude of the peak discharge and the time to peak discharge. It was found that the FGM model have been able to predict this information with good accuracy. The model performs quite well especially for the floods where relation between rainfall and runoff is good. But it is seen that it could not beautifully pick up the baseflow throughout the season in most of the cases. The numerical verification criteria used in model calibration are model efficiency and coefficient of variation of the residual of error. Apart from these numerical verification criteria, visual inspection of observed and computed daily flows is also made in model calibration. In this study, it is seen that the diagnosis performs well. Therefore, the FGM model is generally considered to be suitable in Myanmar catchments. A denser network of rainfall stations should be established in the study area.