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Real Time Runoff Forecasting Using Seasonal Parameters in Consideration of Antecedent Conditions

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Hydrologic models have the importance in runoff forecasting especially for reservoir management. Implementation of a hydrologic model for real time forecasting is a challenging task, since it requires selection of convenient model parameters besides numerical weather prediction data to forecast runoff. In this study, seasonal parameter sets, developed after calibration and validation steps of a conceptual hydrologic model Hec-HMS, are selected in consideration of antecedent precipitation conditions to forecast runoff in Yuvacık Dam Basin.

Yuvacık Dam Basin has a 258 km2 drainage area and is located in the eastern part of Marmara Region of Turkey. It is built to provide 142 million m3 of drinking and municipal water annually for city of Kocaeli with its 56 million m3 reservoir capacity. Providing uninterrupted water with a relatively limited reservoir and downstream canal capacity, necessitates the development of short-term strategies which are comprised of two components. These are, the real-time forecasting of reservoir inflow using rainfall and snowmelt as the leading indicators, and implementation of reservoir operation guide lines.

A semi-distributed hydrologic model Hec-HMS is cross calibrated and validated for the runoff simulation of totally 85 events composed of 45 rainfall and 40 mixed rainfall/snowmelt events observed in between 2001 – 2011 water years. Loss and baseflow parameters are calibrated using a tolerance of 20% difference in peak flow and volume. To check the internal validity of the model, in addition to percent differences, simulated snowmelt amounts are compared with the observed ones based on the snow water equivalent values. According to cross calibration results, model parameters were classified seasonally with their uncertainties, minimum and maximum limits. These parameters are validated for 2010 and 2011 water years, in consideration with 5 days antecedent precipitation conditions to predetermine the initial loss values. From this point of view, daily runoff is forecasted by coupling the numerical weather prediction temperature and precipitation data (MM5 data) with Hec-HMS model for 2010 and 2011 water years. The results of real time forecasting provide a decision support tool for the managers to take relatively easy decisions for reservoir operations under flood or drought conditions.