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The use of HBV model for flash flood forecasting

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Most of existing rainfall-runoff models were originally developed with daily data. The standard HBV model is normally operated on daily time step too. But many flood events in Slovenia, usually flash floods, are result of intense frontal precipitation combined with orographic influences. To use the HBV model for flash flood forecasting the model was calibrated with time step of one hour. The main obstacle in modelling with short time step is the lack of data needed for model calibration. In catchments with orographic influences the variability of precipitation is high and the need for accurate measurements with short time intervals is of great importance. However, the HBV model enables the simulation of hydrological variables at hourly time step and can be used in pre-warning system.

Some analyses were performed to show the influence of hydrological variables to runoff. The antecedent soil moisture is significant for catastrophic floods in Slovenia. Analysis of two flood events with similar intensity and amount of precipitation but different soil moisture conditions showed that extremely dry soil conditions could considerably reduce the runoff, even in autumn months when vegetation and evapotranspiration have no high effect. More than 30% of total precipitation infiltrates into the soil under such conditions.

The uncertainty of simulated river discharge is mainly result of precipitation uncertainty associated with the basin average precipitation. The uncertainty of predicted conditions, especially the occurrence and amount of precipitation, is the primary source of uncertainty in hydrological forecasting. The incorrect estimation of precipitation can give an error in runoff and consequently, hydrological uncertainty. Especially for small catchments the spatial and temporal distributions of precipitation show a significant influence on peak discharge and total runoff. To find out the mea-

sure of runoff uncertainty regarding to precipitation error, the analysis of sensitivity of the model to rainfall error has been performed. The results have shown that an error in precipitation amount results in greater error of runoff. The error of 10% in the amount of precipitation causes an error of 17% in the peak of flood wave. The relationship between the errors in rainfall and peak discharges is polynomial. The relationship is not dependent on catchment area. Quantification of uncertainty is necessity and will increase the reliability of hydrological forecasts and enable users to make decisions about the flood risk.