Forecasting river discharge using coupled WRF-NMM meteorological model and HBV runoff model, case studies

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ABSTRACT: This paper examines two episodes of heavy rainfall and significantly increased water levels. The first case relates to the period including the beginning and the end of the third decade of June 2010 at the Kolubara river basin, where extreme rainfall led to two big flood waves on the Kolubara river, whereat water levels exceeded both regular and extraordinary flood defence and approached their historical maximum. The second case relates to the period including the end of November and the beginning of December 2010 at the Jadar river basin, where heavier precipitation caused the water levels of the basin to reach and surpass the occurrence limit (warning level). The HBV (Hydrological Bureau Waterbalance-section) rainfall/snowmelt – runoff model installed at the RHMSS uses gridded quantitative precipitation and air temperature forecast for 72 hours in advance based on meteorological weather forecast WRF-NMM mesoscale model. Nonhydrostatic Mesoscale Model (NMM) core of the Weather Research and Forecasting (WRF) system is flexible state-of-the-art numerical weather prediction model capable to describe and estimate powerful nonhydrostatic mechanism in convective clouds that cause heavy rain. The HBV model is a semi-distributed conceptual catchment model in which the spatial structure of a catchment area is not explicitly modelled. Instead, the sub-basin represents a primary modelling unit while the basin is characterised by area-elevation distribution and classification of vegetation cover and land use distributed by height zone. WRF-NMM forecast shows very good agreement with observations in terms of timing, location and amount of precipitation. They are used as input for HBV model, forecasted discharges at the output profile of the selected river basin represent model output for consideration.

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