



Ensemble forecasting of spring runoff volumes and hydrograph peaks

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A technique of long-term (2-3 months) ensemble forecasting of the spring runoff volumes and the peak discharges has been developed. The technique is based on the use of the physically based model of runoff generation combined with the weather generator. The physically based model includes description of snow accumulation and melt, soil freezing and redistribution of soil moisture during autumn and winter period, processes of runoff generation after the beginning of spring snowmelt period. The weather generator consists of stochastic models of daily temperature and precipitation. The physically based model is applied to calculate missing initial river basin conditions (the snow water equivalent, the indexes of soil moisture and depth of frozen soil over the area) before forecasting and to estimate the runoff hydrographs during the lead-time period. The weather generator with Monte Carlo simulations, weather predictions or chosen weather scenarios are used to provide opportunities of assessing the meteorological inputs for lead-time periods and to estimate the probability distributions of the forecasted runoff characteristics. The results of forecasting of spring runoff volumes have been compared with the results which can be received on the basis of regression relations between spring runoff volume and the initial river basin indexes taking into account possible meteorological conditions during lead-time period. The case study has been carried out for the Sosna River basin (catchment area is 16400 sq. km). The best predictors have been chosen and the uncertainty of the forecast has been estimated.