Extreme snowmelt floods: frequency assessment and analysis of genesis on the basis of the dynamic-stochastic approach

A. Gelfan

Water Problems Institute of RAS, Hydrological Cycle Modelling Laboratory, Moscow, Russian Federation
(hydrowpi@aqua.laser.ru, +7-(0)95-1355415)

A dynamic-stochastic model, which combines a physically based model of snowmelt runoff formation with a stochastic weather generator, has been proposed. The physically based model describes snow accumulation and melt, vertical heat and moisture transfer in a soil, detention of melt water by the depressions at the catchment surface, overland and channel flow. The weather generator includes stochastic models that produce daily values of precipitation, air temperature, and air humidity during a whole year. Daily weather variables have been generated by Monte Carlo procedure and transposed to snowmelt flood hydrographs by the physically based model. Specific censoring procedure has been developed to select along the generated weather scenarios these ones that can lead to generation of the extremely high floods. The developed procedure has allowed one to minimize a number of the model runs needed to calculate floods of low exceedance probabilities. The dynamic-stochastic model has permitted to describe, in details, genesis of the extreme snowmelt floods exceeding the maximum observed flood in the Seim River (the catchment area is 7460 km2) located in the central part of the European Russia.