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Use of «MLCM3» software for flash flood modelling and forecasting in changing climate

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Accurate and timelyflashfloodsforecasting, especially, in ungauged and poorly gauged basins, is one of the most important and challenging problems. In changing climate and variable anthropogenic impact on river basins, as well as due to low density of surface hydrometeorological network, flash flood forecasting based on "traditional" physically based, or conceptual, or statistical hydrological models often becomes inefficient. The developing economy and population safety in changing climate make us to issue warnings based on reliable forecasts. For this purpose, a new hydrological model, MLCM3 (Multi-Layer Conceptual Model, 3rd generation) has been developed in the Russian State Hydrometeorological University. MLCM3 is a rainfall–runoff model with flexible structure and high level of "conceptualization". Model forcing includes precipitation and evaporation data basically coming from NWP model output. Water comes to the outlet through several layers; their number as well as two parameters (thickness and infiltration rate) for each of them, surface flow velocity (when the top layer is full of water) are optimized.The main advantage of the MLCM3, in comparison to the Sacramento Soil Moisture Accounting Model (SAC-SMA) and similar models, is that its automatic calibration is very fast and efficient with less volume of information. For instance, in comparison to SAC-SMA, which is calibrated using either Shuffled Complex Evolution algorithm (SCE-UA), or Stepwise Line Search (SLS), automatically calibrated MLCM3 gives better or comparable results without using any "a priori" data or essential processor resources.For the model calibration, the multi-scale objective function (MSOF) proposed by Koren is used. Other types of objective functions also can be used, such as mean square error, Nash-Sutcliff criterion, and criterion. The presented work was funded by the Government of the Russian Federation (Grant No. RFMEFI58316X0059; the code of the application "2016-14-585-0005-002) for research under supervision of the leading scientists at Russian State Hydrometeorological University.

Biography

Daria V.Sokolova, DinhKha Dang and Vadim A. Kuzmin have experience in forecasting and modeling of rainfalls in conditions of a changing climate. A method has been developed for presenting the results of the background forecasting of rain floods due to the fact that the applicant developed a new software "MLCM3" based on the developments of the RSHU and improved in the project "Development of methodological bases and management technologies Water resources of river systems insufficiently illuminated by hydrometeorological observations (on the example of the Mekong river basin).

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Notes:

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