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Rain floods regime in the Amur Basin under climate changes impact: assessing by dynamic-stochastic modelling

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A number of extraordinarily rare hydrological events, occurred in the Amur Basin over the past 20 years, support the reality of runoff regime alteration along evident climate changes. The most suitable tools to study the hydrological consequences of climate changes impact is the dynamic-stochastic modeling. For assessment of climate changes impact we used prediction scheme with basin-indicators, the core of that is regional rainfall-runoff model (Flood Cycle Model, FCM). Indicators are the small basins, which were used to calibration and parameterization of FCM. Input data is daily total precipitation. Output is calculated hydrograph as sequence of daily hydrographs. The climate scenarios used are very simple: just increasing sum of precipitation for 10 and 20%. Only 2 statistical moments (norm and variation coefficient) and only for 2 hydrological parameters (maximal discharges of rain floods Qmax and seasonal total runoff during Jun-Sept WVI-IX) were estimated with the model runs
Two test-bed basins were selected (every of which includes few small catchments) for experiments - Ussuri river near Kirovsky, 24400 km2, and Bureya river near Malinovka, 67400 km2. First stage of work includes the simulation experiments with real precipitation from nearest meteo-station. Thereby we got model frequency curves of for each small basins, that seems in good accordance with observed ones, lying inside of their confidential intervals and reproduce individual features of different basins.
Next stage was trying the climate scenarios. Two approaches were used to increase precipitation. One (analog) was to attract the precipitation data from others meteo-stations, located in much rainy conditions, second one was just to multiply the precipitation by coefficient. It was found, that results with analog scenarios are very different, but in average is very similar to just increasing the precipitation for 20%. So at last we used only real precipitation, increased by 10 and 20%.
Finally, based on the experiments results the relations were constructed of percentage changing of means of Qmax and WVI-IX against different percentage changing of precipitation for every basin investigated. The scenario modeling show complicated and ambiguous trends within Amur Basin – the runoff changes appeared much higher than changes of precipitation (2-3 times more) in Ussuri river basin and slightly less for Bureya river basin, variation coefficient appeared stable. Thus we can conclude, that with rising of season precipitation, the mean of rain floods maximal discharges and the total runoff rise at a growing rate.
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