

Model of runoff formation in the whole Amur River basin

Andrey Kalugin and Yuri Motovilov

Water Problems Institute of Russian Academy of Sciences, Moscow, Russia (andrey.kalugin@iwp.ru)

In recent years, in the Amur River basin were created models of runoff formation only separate subbasins or hydrological processes. The problem of development of a regional hydrological model for the whole Amur basin has become particularly relevant after the flood of 2013. In this study we developed a semi-distributed model of runoff formation based the ECOMAG hydrological modeling software, which describes the spatial and temporal variability of hydrological processes in the whole Amur River basin. Basin schematization was carried out by 1x1 km global gridded datasets: DEM HYDRO1k, FAO/IIASA Harmonized World Soil Database, and USGS Global Land Cover Characteristics taking into account flow regulation by reservoirs and lakes. The meteorological database includes daily time series of air temperature and humidity, precipitation measured at 232 meteorological stations. Calibration and validation of hydrological model was carried out by calculating the Nash-Sutcliffe efficiency and percent bias on basis of daily discharge data for the period 1994-2013 at 15 gauging stations which are located on the channel of Amur River and main tributaries. In addition, it was carried out spatial and temporal analysis of formation conditions of the flood in July-September 2013 in the Amur River basin. On the basis of developed regional hydrological model appears to more detailed analysis of formation conditions of the flood in 2013, than it can be done according to the available observational data, because the observations of runoff factors (e.g., data of soil moisture and snow cover characteristics) are absent in most part of the basin. According to simulation results were done maps of the spatial distribution of calculated values of runoff factors (snow water equivalent and soil moisture), as well as the distribution of river runoff in the Amur River basin in different date during formation of the flood in 2013. Based on these maps, as well as maps of measured rainfall was estimated impact of major natural factors of this flood.