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Assessment of hydrological extremes in the basins of Shilka and Argun rivers (Far East of Russia) in changing conditions

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Eastern Transbaikal region of Russia is formed by the basins of the Argun and Shilka Rivers (the upreaches of the Amur River). This region is simultaneously under the flood and drought hazard threat due to the combination of dry continental climate and monsoon impacts. Observed intensification of extreme hazard events in the region requires the scientific base of development of adaptation and mitigation measures.
The aim of the study is the analysis of long-term variability of hydrological characteristics of the region by the means of mathematical statistics and projection of hydrological extremes in changing conditions of climate and landscapes based on hydrological modelling.
Our research consisted of two stages. Firstly, we developed the database of observed daily hydrographs for about 50 runoff gauges of the region with average continuous period of observations 50 years (up to 2013) and areas from 12.3 to 200000 km2. Statistical analysis of the data was conducted and the trends of changes were assessed and analyzed.
At the second stage we selected four river watersheds as the objects of modelling, namely, the gauging stations at the rivers Zun-Cooka, Gazipur, Borzya and Mogoytuy, ranging in size from 100 to 4000 km2. The basins are characterized by the variety of runoff conditions. Average elevation is about 650 m, hilly plateaus dominate the relief. The landscapes are taiga and forest-steppe with discontinuous permafrost. The climate is continental, annual precipitation varies within the range 200-450 mm, runoff – from 30 to 100 mm.
The objectives of modelling stage were 1) the estimation of the hydrological model's parameters and its validation at historical data, 2) development of conceptual scenarios of changes of climate and landscapes, 3) running the model in projection mode to assess the implications of possible changes in hydrological regime.
High variability of climate and hydrological regime do not allow for conventional modelling procedures to be used in this region. By this we mean the methods of calibration which became inevitable in modelling practice. The distributed process-based model Hydrograph developed in Russia (Vinogradov et al., 2011; Semenova et al., 2013) was used as the tool in this study. It explicitly describes hydrological processes in different permafrost environments including the dynamics of ground thaw/freeze (ex., Lebedeva et al., 2014). In the Hydrograph model the processes have a physical basis and certain strategic conceptual simplifications. The level of model complexity is suitable for a remote, sparsely gauged region and allows for a priori assessment of the model parameters.
The results data analysis, the model verification and runoff simulations for future climates will be explored in presentation.

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