

## **Modelling of water inflow to the Kolyma reservoir in historical and future climates**

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Kolyma hydropower plant is the most important electricity producer in the Magadan region, North of Russian Far East. North-Eastern Russia has sparse hydrometeorological network. The density is one hydrological gauge per 10 250 km<sup>2</sup>. Assessment of water inflow to the Kolyma reservoir is complicated by mountainous relief with altitudes more than 2000 m a.s.l., continuous permafrost and sparse data. The study aimed at application of process-based hydrological model to simulate water inflow to the Kolyma reservoir in historical time period and according to projections of future climate. Watershed area of the Kolyma reservoir is 61 500 km<sup>2</sup>. Dominant landscapes are mountainous tundra and larch forest. The Hydrograph model used in the study explicitly simulates heat and water dynamics in the soil profile thus is able to reflect ground thawing/freezing and change of soil storage capacity through the summer in permafrost environments. The key model parameters are vegetation and soil properties that relate to land surface classes. They are assessed based on field observations and literature data, don't need calibration and could be transferred to other basins with similar landscapes. Model time step is daily, meteorological input are air temperature, precipitation and air moisture. Parameter set that was firstly developed in the small research basins of the Kolyma water-balance station was transferred to middle and large river basins in the region. Precipitation dependences on altitude and air temperature inversions are accounted for in the modelling routine. Successful model application to six river basins with areas from 65 to 42600 km<sup>2</sup> within the watershed of the Kolyma reservoir suggests that simulation results for the water inflow to the reservoir are satisfactory. Modelling according to projections of future climate change showed that air temperature increase will likely lead to earlier snowmelt and lower freshet peaks but doesn't change total inflow volume.

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