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Spatial variability of streamflow in continuous permafrost environment in Central Yakutia, Russia

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Runoff generationin permafrost environments arecontrolled by time-variable frozen aquiclude, limited connectivity between surface and ground water, long snow season and period of river ice cover. Although influence of ground thawing/freezing and surface conditions on streamflow generation is not fully understood,both rain and snoware usually assumedto be themain driver of any hydrological events.
The study aims at investigation of runoff formation and identification of key hydrological processes at set of closeby watersheds in Central Yakutia, Eastern Siberia, Russia.Nineteen river basinswith areas from 40 to 65000 km2, practically all active gauges up to the moment, were chosen for streamflow analysis. Precipitation and air temperature data from 22 meteorological stations were employed for the study.The river basins are characterized by relatively flat topography, dry and cold climate. Mean annual precipitation varies from 240 to 390 mm/year. Mean annual air temperature changes from -7.7 to -11.9°C. Altitude ranges from 60 to 1000 m a.s.l.Permafrost thickness is 200-500 m. Dominant landscape is coniferous taiga.
Mean annual flow depth of the studied rivers varies in more than two orders of magnitude from 0.61 to 80 mm/year. High spatial variability of streamflow thatfar exceeds variability of precipitation suggests that surface conditions could play more important role in runoff generation than rain and snow input. Variation coefficient (Cv) characterizes year-to-year dynamics of streamflow. Cv of rivers with lower flow depthis much higher than “high flow” rivers. Role of different control factors such as geology, permafrost distribution, lakes, contributing areas and others will be discussed. Careful investigation of runoff generation processes is needed for successful modelling strategies and future projections.
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