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A universal approach to modelling runoff formation processes as a way to restrict data requirements for model building and to increase the model's applicability to poorly gauged domains (the remote basins of Eastern Siberia as a case study)

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At present, the approach oriented to description and modelling of specific river basins and/or specific groups of runoff formation processes is prevailing. The value of such models is refuted by incomplete physical validity and necessity of parameter calibration for any new objects. Evidently, in changing uncertain conditions hydrological science has to move from calibration-based to new more universal models.
The principle of universality refers to the essential fundamentals of physics suggesting that the process of runoff formation must be the same in any point of space. The latter implies the possibility to simulate the runoff formation processes in basins of any type regardless of their scale and landscape/climate characteristics within the framework of a single methodological approach, its mathematical realization and unified informational support. To our vision the degree of model's universality is the measure of its adequacy to the natural processes.
Several important principles are to be fulfilled in the scope of the idea of universality in hydrological modelling and they strongly relate to the approaches to model parsimony. The universal model should use only existent and common information. It concerns the forcing data and parameters which should be available for any territories.
The appropriate characteristics describing runoff conditions should be found on one hand to be general for any basin and at the other hand to be able to take into account their unique properties. In such a way model parameters reflecting the objective properties of watersheds obviously would have very clear physical meaning. The possibility for apriori estimation of the model parameters on the basis of laboratory and field methods of measurements or expert evaluation is essential. Consequently such parameters can be systematized, generalized and normalized in opposite to calibrated parameters of those models that adding to surface heterogeneity aggregate all the uncertainties of defective representation of processes.
The distributed hydrological model "Hydrograph" is being developed at the State Hydrological Institute under the supervision of Prof. Yu.B. Vinogradov based on mentioned above principles. Its successful application for basins of different scales as well as various geographical zones without change of the model's structure, algorithms and based on unified set of model's parameters has proven the possibility of general approach in hydrological modelling. The presentation would be devoted to the description of the model's main properties supported with the results of the simulations across the vast data scarce territory of Eastern Siberia.