



Application of a physically-based distributed rainfall-runoff model TOPKAPI-IMMSP to gauged and ungauged mountainous catchments of Transcarpathean region, Ukraine

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Physically based distributed rainfall-runoff models were recognized recently as a powerful tool to proper reconstruction of watershed discharge distribution based on detailed GIS maps of the region. Additionally, this kind of models seems to give good calculation results even in situations where no historical discharge observations are available and thus no calibration is possible (ungauged basins).

The distributed rainfall-runoff models were found applicable for watersheds of different area scales: from 1 km² to 100 000 km². The most known examples are SHETRAN, Mike SHE and CASC2D. From the other hand, these models usually have a high complexity and are computationally demanding.

Since the creation of complex distributed models the work on their simplification has been conducted. TOPKAPI (Todini, 1995) and LISFLOOD are to be mentioned as good examples of simplified models which still provide proper simulation results.

The TOPKAPI-IMMSP model was created based on the TOPKAPI model equations, which include description of soil infiltration, overland and channel flow processes.

The model was successfully applied to several catchments in Transcarpathian region of Ukraine, Tisza river basin - the region known for its high flash floods, quite often catastrophic.

TOPKAPI-IMMSP was used for two main tasks:

- To reconstruct historical discharges in the outlet point of a gauged watershed (about 500 km²) based on measured precipitation time series.
- To provide runoff analysis for a small ungauged catchment (about 5 km²) of a small town, to estimate capacity of pumping station designed for eliminating consequences of catastrophic rainfalls.

For the gauged watershed in the region the modeling results were compared to the calculations of conceptual rainfall-runoff model Mike11 NAM, DHI Software. For the ungauged case the conceptual model was inapplicable, so recommendations to decision makers were based only on application results of the TOPKAPI-IMMSP model.