

## Using Remote Sensing and GIS technologies for Hydrological Modelling

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**It is well known that river flow regimes depend on climate and land use factors, which have spatial and temporal variability. Hydrological models created base on remote sensing and GIS technology allow taking into consideration all factors influencing river flow, and facilitate calculating and predicting of hydrological characteristic of river.**

The hydrological model PREVAH (Precipitation-Runoff-Evapotranspiration-HRU (Hydrological Responsible Unit) model) was used for studying hydrological process in the Sokuluk River Basin (SRB) – the typical river of Kyrgyzstan. Model was specifically developed with the aim of taking into account as much as possible of the physical relationships of a complex alpine catchment. It belongs to the group of spatially distributed watershed models.

Input information of the Model is spatial data (elevation, land use, slop, soil and others) and meteorological data (precipitation, air temperature, air humidity, global radiation and others).

The main research element during preparing input data for modeling was the creation of a land use GIS-layer including glaciations.

The land use map was created based on the 7 spectral bands of a LANDSAT satellite image on 24 August 2000 with a 30 m resolution. The satellite image classification included two steps:

1) ground truth from June to August 2004 according to the FAO classification (description of more than 50 points for different classes),

2) supervised classification of satellite imagery using ERDAS IMAGINE 8.6.

For the study area, 6 types of land use classes were differentiated. The largest region is occupied by non-vegetated area (170,6 km<sup>2</sup>) (rocks, taluses, glaciers) which is situated above 3200 m a.s.l. The vegetation is represented by bushes and grassland with various cover density. The largest area covered by vegetation (108,7 km<sup>2</sup>) is occupied by continuous open grassland. Continuous closed grassland covers 34,3 km<sup>2</sup>, occupies elevation from 1500 to 2500 m and is located basically on northern, northeastern and northwestern slopes.

More detailed analysis was conducted for the cover type “glacier”, since it has high hydrological significance. In the result was obtained chance of glacier area calculations for last 40 years and map of glaciers.

The obtained GIS layer of current land use allows improving quality of hydrological modeling. The manual calibration of PREVAH through control experiments with HRU related discretization generated catchment specific model parameters, that allow a good reproduction of the runoff-generation dynamics -  $E^{2lin}$  (line efficiency) and  $E^{2log}$  (logarithmic efficiency) are above 0.86.