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Evaluation of changes in snow water equivalent in different altitude zones

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Snow cover is specific for its seasonality in Slovakia; the data of the snow cover have been collected since the middle of the 20th century. In this work we evaluated the snow cover and its change in the basins in Slovakia by the measured data and modelled data of the decade 1961 – 2010.
The semi-distributed model derived from the concept of the HBV was used. The model was adapted for the simulation of the snow water equivalent (SWE) at different altitude zones. The input data were the mean daily values of the air temperature, the mean daily precipitation, and the mean daily discharges at the outlet point of the catchment. The zones' daily rainfall was processed by the interpolation method of inverse distance weighting; the zones' average air temperature values were calculated by linear regression between the stations' mean daily air temperatures and the altitudes of the stations. The daily evapotranspiration values were calculated by the Blaney-Criddle method. The calculations were based on the basin's average daily air temperature and the sunshine index of the river basin. The input data were divided into five altitude zones and the area' dimensions were set according to the five altitude zones.
The next step was the validation of the simulated SWE with the measured data. We compared the simulated daily values in each altitude zone, which represent the zone's average data, with the measured value of the SWE for the mean altitude of each zone. There is a satisfactory degree of compliance between the daily simulated and measured SWE values. The changes in the simulated SWE were evaluated by comparing the mean, minimum and maximum daily values of SWE in each altitude zone. There is a decreasing trend in the values of the snow water equivalent in recent decades. Also, the trend was confirmed by a non-parametric Mann-Kendall test. The adapted rainfall-runoff model provides detailed output data, which contributes to increasing the level of accuracy of the modelling of snow accumulation and snow melting in mountainous basins.