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Impact of climate and water management changes on the hydrological balance of the Laborec wetland system

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The modeling of existing and changed conditions of hydrological balance in the selected wetland ecosystem in the Eastern Slovakia Lowland was evaluated using the hydrological model Mike SHE. The pilot area – Sennianska depression is located near by the Senne village, between Laborec and Uh Rivers and it is specific by traditional landscape of meadows, wet meadows, cultivated soils, small water control structures and forests. The pilot area is important in terms of vegetation conditions and for total restoration of the wetland system in the modeling area.
As the input data for modeling of water balance following characteristics were selected: hydrologic and climate data (rainfall, air temperature, potential evapotranspiration), data from gauging stations and ground water wells (discharges, water levels and ground water levels), also the distributed layers of physical-geographical properties and characteristics of the area. Basic layers are represented by digital elevation model, the soil and land use maps and the map of geological layers. Other input data are distributed parameters from land use map, parameters from geological properties and parameters from soil map.
Built-up physically based hydrological model Mike SHE (model domain 1 x 1 m) was used for modeling hydrological balance of the Sennianska depression considering climatic changes scenarios for future decades. Scenarios of possible trends of daily rainfall and average daily air temperature were processed based on outputs of climatic model CGCM3.1, which is the newest version of the Canadian atmosphere and ocean circulation model. Regional modification of the scenarios into the climatic stations on the Laborec River basin was developed at the Department of Astronomy and Astrophysics FMFI UK in Bratislava based on the methodology published in Lapin et al. (2006). Two emission scenarios - SRES A2 a SRES B1 have been used. The first one presents pessimistic assumption of human behavior till the year 2100, and the other is the optimistic one. Results for the scenarios show slow decreasing in overland flow and ground water table in the modeling area in the future.
Built-up hydrological model Mike SHE (model domain 1 x 1 m) was also used for modeling hydrological balance on the Sennianska depression for the changed conditions in water management. Proposals for water management consider increasing in water table in the river, which is crossing the wetland and in surroundings river channels. Increasing of water table in rivers also causes increasing ground-water table in the wetland.