



Integrated monitoring, real-time modelling and forecasting of hydrological processes in small agricultural and forest catchments

Z.Kulhavy (1), L.Tlapakova (1) and F.Dolezal (2)

(1) Research Institute for Soil and Water Conservation, Bozeny Nemcove 2625, 530 00 Pardubice, Czech Republic, (2) Research Institute for Soil and Water Conservation, Zabovreska 265, 156 27 Praha 5-Zbraslav, Czech Republic

The paper presents a concept of integrated monitoring of hydrological processes in small agricultural and forest watersheds. The concept has already been implemented in a nested system of experimental watersheds in East Bohemia and in another small watershed in Central Bohemia. The system relies on network (mainly Internet) communication. The data sources are: automatic continuous measurement of basic state variables (discharges, water levels, temperatures, weather elements etc.), on-line log-books of individual sites, background information (nature, agriculture, land use etc.) in the form of texts, tables, charts, schemes and photos; a map server for interactive publishing of geographic data; real-time simulation tools (using measured data for real-time forecasting and dynamic publishing). The advantage of using Internet environment is its wide accessibility and its capacity to provide easy links to all sorts of supplementary interpretation, such as literature and various relevant websites. The monitoring makes as much use as possible of the principle of nested watersheds. Representative profiles and elementary runoff areas (e.g., in the case of tile-drainage runoff monitoring) have been selected and are being monitored. The Zejbro (48.3 km²) experimental watershed and its nested subwatersheds Dolsky potok (4.78 km²) and Kotel'sky potok (3.21 km²) is monitored in 11 autonomous stations, the other watershed, Eerniei (1.34 km²), is equipped with 3 stations. The flow rate (discharge) is monitored in surface water streams and in drainage systems. The continuous monitoring also comprises water temperature, vertical profiles of soil temperatures, groundwa-

ter levels on selected sites, water levels in small reservoirs and weather conditions. The agricultural activities and land use are monitored discontinuously; water and soil samples for laboratory testing are taken periodically. The performance of tile-drainage systems and their effect on the environment are checked regularly.

A system of automated data transfer and processing for the purpose of short-term forecasting of hydrological processes, using PHP scripts, was implemented in three watersheds in November 2007. In the first phase, the forecasting is based on linear black-box models developed by the Czech University of Life Sciences in Prague. Prediction efficiency of the models is continuously evaluated. The system will be useful for various ways of optimisation of watershed operation, which, in the realm of research, means the optimisation of water sampling schedule, the planning and timing of additional hydrological measurements, etc., and, in practice, means providing arguments for recommending various water management measures of organisational, managerial or technical character (e.g., closing or opening of weirs or outlets etc.) and for real-time warning against flash floods and other dangerous phenomena. Examples of preliminary results are given.