



Assessment of hydrological drought occurrence in Nitra River catchment (Slovakia) in the period 1976 – 2005

A. Machlica, M. Stojkovova and M. Fendekova

Department of Hydrogeology, Faculty of Natural Sciences, Comenius University, Bratislava, Slovakia (machlica@fns.uniba.sk /Fax: +421 2 60296701)

Occurrence of hydrological drought in Nitra River catchment was analyzed and evaluated in two steps. The first step consisted in the calculation of the ratio of average annual discharge on the long-term average in respective gauging station. As a next step, a more detailed study of the occurrence of dry periods was performed for the gauging profiles in which the drought occurrence was the most frequent or severe.

Nitra River catchment is located in the central part of Slovakia. It is a sub-catchment of the Vah River catchment, having a total area of 4 501.1 km². Four gauging profiles, representing the upper (Chalmova gauging profile) and central part (Nitrianska Streda gauging profile) of the catchment, as well as two most important tributaries – Nitrica (Liestany gauging profile) and Bebrava (Biskupice gauging profile) were included into evaluation. Period of hydrological years from 1976 to 2005 evaluated. The assessment was oriented on dry years occurrence, as well as on their influence on stream flow discharges.

The first dry year identified within the evaluated period was the year 1976, in which the average annual discharges decreased below the long-term averages. Distinct decrease was identified in 1976 and in 1984 on Bebrava River catchment where the average annual discharges were only 59 % of the long-term average in Biskupice station. The lowest value in the same gauging profile was reached in 1990 being only 29 % of the long-term average. In the gauging station, the lowest average monthly discharges since 1931 were observed in last four months of the five-year period 1986-1990.

In the nineties, the lowest daily discharges within the whole observation period were

recorded in several stations in the Nitra River catchment, occurring mainly in 1992 and 1993. Values of discharges were often under the long-term average values in this period. Dry periods occurred several times during the hydrological year, mainly in November and January, and also in the summer-autumn period since June till October. The Nitra River discharges at Chalmova station were characterized as extremely low in 1993 (Machlica et al. 2007) and were conditioned by meteorological drought occurrence in the same year. Stream flow drought consequently conditioned groundwater drought occurrence. The proportion of the 1993 yearly base flow on the long-term average was the lowest for the whole assessed period. Development of drought was studied in four gauging stations in very dry and dry years in a monthly step in more details.

Decrease in discharges was distinct mainly in the upper part of the catchment. Values of discharges at Chvojnica brook (right-side tributary of the Nitra River) reached its historical minimum in November 2005.

As a conclusion, it can be said that the occurrence of dry periods is the most frequent in the upper part of the Nitra River catchment because meteorological drought occurrence. The frequency of dry year periods occurrence increased since nineties.

The authors would like to thank to FP 6 WATCH project financial support of the research.

References:

Machlica A., Stojkovicová M., Bara M. 2007: Impact of meteorological drought on the base flow formation. 14th Slovak hydrogeological conference. Abstract, p. 100, ISBN 978-80-969342-3-2