Mean monthly runoff scenarios of the Danube River

PAVOL MIKLANEK\textsuperscript{1}, PAVLA PEKAROVA\textsuperscript{1}, JAN PEKAR\textsuperscript{2} & PETER SKODA\textsuperscript{3}

1 Institute of Hydrology SAS, Racianska 75, 841 03 Bratislava, Slovakia
pavol.miklanek@savba.sk
2 Department of Applied Mathematics and Statistics, FMPI, CU Bratislava, Mlynska dolina, 842 48 Bratislava, Slovakia
3 Slovak Hydrometeorological Institute, Jeseniova 17, 833 15 Bratislava, Slovakia

Abstract This paper is a statistical analysis and long-term prognosis of monthly flows of the Danube River at Bratislava. Analysis of the mean annual and monthly flows implies that, while the annual flow regime of the Danube oscillates around its long-term average, its monthly flows undergo a significant and probably permanent changes, attributable to the elevated air temperatures. Conversely, the observed changes in the flow regime can be explained by altered patterns of precipitation and, maybe, construction of water structures on the upper Danube's major tributaries. Another issue addressed in this paper, concerns the creation of a projection scenario for monthly flows, based on analyses of historical flow records covering the period 1876–2006. The proposed scenario for the time horizon 2075 was compared to other two scenarios derived from several global and regional runoff models. Our scenario originates from analysis of the actual monthly flows recorded over the period 1876–2006, while the second and the third scenarios were created on the basis of the complex climatic and rainfall–runoff models using data from 1960 to 1990.

Key words Danube River; discharge prediction; long-term trends; inter-annual variability; Hurst phenomenon