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Stability of Runoff Regimes of Slovenian Rivers as Determined by the Nováky Entropy Type Index

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Climate change imposes changes on the runoff regime of a river. As a consequence changes in seasonality patterns of rivers may be observed. A hydrological analysis of seasonality of mean monthly discharges of Slovenian rivers has been conducted for the period from 1971 to 2000.

Using mean monthly discharge data from 106 river gauging stations in the Republic of Slovenia (20,273 km^2) and determining the so-called discriminant periods of three consecutive months for three highest (MAX1, MAX2, MAX3) and three lowest monthly discharges (MIN1, MIN2, MIN3) in each year, we could distinguish between 7 runoff regime types in Slovenia.

Furthermore, the stability index proposed by Nováky (2001), being similar to the Shannon entropy index H, was computed for these 106 river gauging stations. The results have shown that maximum hydrological events (MAX1, MAX2, MAX3, and their cumulative sum MAX) have a higher influence on the stability of a certain runoff regime than the minimum hydrological events (MIN1, MIN2, MIN3, and their cumulative sum MIN).

The results of this discriminant analysis were compared with the results of the hierarchical clustering analysis of Slovenian rivers for the period from 1961 to 1990 (using 70 river gauging stations) and for the period from 1971 to 2000 (using 43 river gauging stations). The similarity among river gauging stations was calculated on the

basis of the Manhattan distance, and for their clustering into groups the Ward method was used. The comparison between the two periods and two methods has shown some noticeable changes in runoff regime in the observed period. All results of the seasonality and stability analyses were shown graphically on the map of Slovenia for a better regional presentation.

Finally, the Pearson correlation coefficients for time series of monthly discharge data in each of 40 selected river gauging stations for the two periods (1961–1980 and 1981–2000) were compared to less known and empirically proposed Nováky (2001) stability classes of runoff regimes, determined for these river gauging stations.