



Regional frequency analysis of k -day precipitation totals in the Slovak Republic – delineation of homogeneous groups

L. Gaal (1), M. Lapin (2), J. Szolgay (3)

(1) Czech Hydrometeorological Institute, Praha, Czech Republic (ladislavgaal@hotmail.com)

(2) Comenius University, Bratislava, Slovak Republic (lapin@fmph.uniba.sk)

(3) Slovak Technical University, Bratislava, Slovak Republic (jan.szolgay@stuba.sk)

Regional frequency analysis (RFA) of precipitation totals based on the estimation of parameters of the distribution function using L-moments is recently being adopted in the geographical-climatological conditions of the Slovak Republic. The poster is focused on the first stage of the regional L-moment algorithm, namely on the delineation of homogeneous regions of precipitation with the aim to assess if the whole area Western Carpathians, which cover the areas of the Slovak Republic, can be considered as a homogeneous region from the point of view of the maximum k -day precipitation totals ($k = 1$ to 5 days) for the calendar year, the warm half-year and the cold half-year or it has to be split up into several homogeneous regions as suggested by climatologic theory.

56 climatological stations, approximately evenly distributed on the whole territory of the Slovak Republic have been selected for the analysis. 29 stations of this selection have no gaps in their daily rainfall records from the period 1961(1951)-2003. The other stations have shorter gaps in their records; however, each of these sites has at least 35 complete years of observation. 2 homogeneity tests (the H -test from Hosking and Wallis, and the X_{10} -test from Lu and Stedinger) have been used to examine the homogeneity of the proposed regions.

The results of the tests suggest that, in case of the maximum k -day precipitation totals ($k = 1$ to 5 days) for the *calendar year*, Slovakia could be treated as a single homogeneous region. Possible heterogeneities have been found in case of the maximum 2-day

summer precipitation totals and the several-day (3-, 4- and 5-day) *winter* precipitation totals, which results are consistent with the theoretical assumptions of precipitation genesis.

In the next step cluster analysis was employed in order to delineate a set of homogeneous groups for each combination of the 3 selected periods and 5 durations. A suitable choice and combination of site characteristics that refers to different physical mechanisms of precipitation genesis does not lead, in principle, to a single successful regionalization of the maximum k -day precipitation totals. A climatologically reasonable set of site characteristics was therefore selected:

- 3 characteristics of geographical location: latitude φ , longitude λ and elevation H ;
- Mean annual precipitation totals $\bar{R}$;
- Lapin's indices of the Mediterranean effect L_S and the inland effect L_V , respectively – 2 special characteristics of the inter-annual variability of monthly precipitation totals for Slovakia;
- The ratio of the mean precipitation totals for the warm and cold half-year R_W/R_C .

The results of the cluster analysis confirm the reasonableness of the selection of the aforementioned site characteristics. 6-clusters were preferred because this selection also reflects the long-term precipitation climate of Slovakia. The problem of the influence of the choice of clustering variables and their physical interpretation and the number of clusters on the final results is discussed.

Key words: Slovak Republic, maximum 1- to 5-day precipitation totals, calendar year, warm / cold half-year, regional frequency analysis, cluster analysis, homogeneous regions, Lapin's indices.