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title: **Spatial distribution of potential aquifer recharge from precipitation for the period of 1951–1980 over Slovakia**

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In this study, the evaluation of effective precipitation by means of geostatistical analysis of meteorological stations over the territory of Slovakia for the period 1951–1980 is presented. The effective precipitation is the essential part of any hydrogeological study involving estimation of recharging groundwater amounts. Since the effective precipitation is primarily defined by temperature and precipitation, both varying strongly with local geomorphology, a very careful approach in spatialization of data drawn from sparse meteorological stations must be taken. For this purpose a detrended kriging is recommended as a favourable method and its usefulness is proven on the territory of Slovakia in this study, where the method of residual kriging with removed global trend was used to estimate mean monthly and annual air temperatures and precipitation totals. To identify global trends in the two fundamental climatologic variables — temperature and precipitation, a stepwise regression was applied to detect their trends in the geographic position as well as in the local geomorphology (Adam et al., 2006). Two positional and three geomorphological parameters were judged to be governing the global variation in these variables. Verification of the results proved that the method is well capable of reproducing observations.

For the sake of mean potential evapotranspiration evaluation, the Thornthwaite's method (1948, 1955) with monthly calculation steps was used. The results gained were subsequently entered into the calculation of actual (real) monthly evapotranspiration, where the response of precipitation totals and potential evapotranspiration to the change in soil water content was examined, which determines the real quantity of water evaporated from the surface. The outcome is the map of spatial distribution of potential aquifer recharge by effective precipitation, calculated by subtracting actual (real) evapotranspiration from precipitation totals. For the whole Slovak territory, the average value of effective precipitation on the 1951–1980 period is of 176.5 mm (5.60 l s^{-1} km^{-2}). The mean precipitation for the same period was 721.9 mm and mean actual evapotranspiration 545.5 mm (mean potential evapotranspiration according to Thornthwaite's method was 638.3 mm). Average annual volume of precipitation over Slovakia (49,030 km^2) is then 35.395 km^3, and a ratio of unevaporated water ca 24.4% (8,653 km^3). When looking at the calculated data in regional details, we can realize that the most of the water wealth of Slovakia is created in only several parts of the regions located in the north and center of the country itself. In the mountains, spatial averages of effective precipitation exceed 500 mm or even 700 mm. On the contrary, 60–70 mm of the average effective rainfall can be found in the lowlands — see Fig. 1.

Because only a part of the data from existing meteorological stations was available at the time of this study, a future work on including remaining stations and thus increasing the precision of effective rainfall distribution is necessary. In this study, monthly average air temperature data from 98 climatic stations and monthly average precipitation totals from 211 stations were used. The representative period for the results presented is 1951–1980. Nowadays, in the monitoring network of the Slovak Hydrometeorological Institute there are 105 climatic stations and 680 precipitation stations, what means an increased potential for better solutions in the future. Nevertheless, an altitudinal distribution of these stations still does not cover higher altitudes, where majority of effective precipitation takes place.

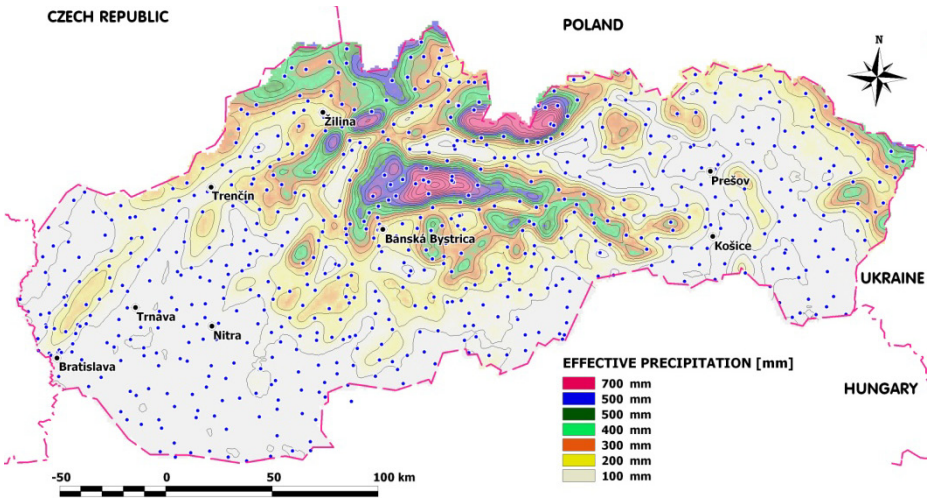

Figure 1. Map of mean effective precipitation (in mm) over Slovakia during the period 1951–1980. Contours base interval is 50 mm. Precipitation stations are shown as dots.

The practical consequence of assessing the mean effective precipitation for individual regions is appealing not only with respect to groundwater recharge, but also in solving quality problems. In this respect, the climatic pollution attenuation potential, e.g. diminishing of contamination by simple dilution, is of particular interest. The partitioning of the effective precipitation into surface- and groundwater runoff depends on hydraulic properties of rocks and local morphological characteristics, especially the slope, and should be under the scope of further investigations.

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