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Modeling of atmospheric precipitation field in Slovakia

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A common practical problem in displaying the atmospheric precipitation field is the creation of maps of their spatial distribution. For the construction of precipitaion maps for period 1981 – 2010 produced in Slovak Hydrometeorological Institute the relation between mean precipitation amount and altitude was used. This altitude dependence has high spatial variability and therefore for generation of the maps the local variant of interpolation according to the CHMI method has been selected (used also in the creation of rainfall maps in Climate atlas of Czechia in 2007). This application, AGHydroInterpolace (AGHI), has been carried out using the ArcMap 9.3 software.
Using station data from 498 "real" precipitation stations in Slovakia, the applied AGHI method of CHMI in certain regions with some complex topography did not provide accurate and reliable results, so the final precipitation fields were not well expressed mainly within some mountainous areas. Existing precipitation stations are predominantly located in valley positions and with lower density in mountains. Modeling of atmospheric precipitation field using the AGHI interpolation was originally developed for the less complex terrain of the Czech Republic with higher density of precipitation stations. In these conditions the use of the set of additional points wasn't required to produce more accurate precipitation maps. Within the "problematic" mountain regions of Slovakia the set of 63 additional points was therefore specified to fill in an existing network of precipitation stations. Precipitation amounts estimated in these additional points were derived from the known regional dependence on the altitude and from other available sources (totalizers).
Our approach is focused on the optimal use of available data for determination of the local correlation between station data and altitude for better estimation of precipitation field in areas with lower station density (particularly in mountainous areas). It's clear that in case of application of just few additional points in complex terrain and peak positions (with expertly estimated values of precipitation amount), this method allows generation of better maps with the more realistic and credible estimate of the precipitation distribution even in orographically complex environment.