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Interpolation methods for precipitation fields in Europe

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Atmospheric precipitation reveals very large spatial and temporal variability, much more than many other meteorological elements. Spatial distribution of precipitation depends on local environmental conditions but determination of mentioned dependence, especially in the case of a large scale, becomes problematic. Great spatial variability, complicated dependence on local conditions combined with relatively poor and irregular distribution of meteorological stations cause that spatial analysis of the precipitation is burdened with bigger prediction errors compared with other meteorological elements.

The goal of this study is a selection of the best spatialisation method of precipitation fields for the large territory of Europe. The main dataset contains mean monthly sums of precipitation for normal period 1961-1990 from 816 meteorological stations located in Europe and neighbouring areas. Four precipitation indices (annual, winter and summer sums of precipitation, precipitation concentration index) differing in the range of variability and the pattern of spatial distribution were put through the examination. The precipitation indices were interpolated by deterministic methods (Inverted Distance Weighted, Radial Basis Function, Local and Global Polynomial) as well as geostatistic ones (ordinary, universal, simple and disjunctive kriging) provided by Geostatistical Analyst Tools for ArcMap.

It was stated on the base of the statistical characteristics of prediction error, that ordinary kriging seems to be the most suitable method for interpolation of annual, summer and winter sums of precipitation on the large scale of Europe. Universal kriging gives only a little bit worse results in the case of annual precipitation, than ordinary kriging. Interpolation of summer precipitation in Europe can also be performed by IDW and than by universal kriging methods.

The precipitation concentration index shows considerably smaller range of the spatial variability than precipitation sums. This difference is significant feature from interpolation methods' point of view. As it turned out the spatial analysis of the concentration index using simple kriging gives the smallest value of root mean square error (RMS).

Finally it is worth noting that the selection of the best interpolation method for precipitation fields is rather difficult issue. The values of the statistical characteristics of prediction error in the case of a few methods were not considerably different.