Spatial interpolation methods based on the use of elevation data

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The availability of good and reliable rainfall data are fundamental for the most of the hydrological analysis. Particularly the prediction of the spatial distribution of rainfall is essential for establishing the water balance and for the assessment of flood discharge in a basin. Many methods have been proposed to estimate rainfall fields starting from point measurements. After a brief review of the methods previously developed, this paper compares many of these algorithms in order to estimate the rainfall fields of Sicily. The used algorithms are geostatistical models as Ordinary Kriging, Simple Kriging with varying Local Means, Kriging with External Drift and Cokriging, together with the Radial Basis Function Network, based on neural network and Geographically Weighted Regression. Some of these methods incorporate the elevation into the spatial prediction of rainfall fields by means of the use of a DEM. These algorithms are applied to annual and monthly average rainfall data of Sicily (Italy), measured at 248 rain gages on a surface of about 25,000 sqkm. Rainfall fields produced with these algorithms are compared with some of the simplest interpolation models like Spline surfaces and Inverse Distance Weighting, using cross-validation and validation on a independent dataset not used in models development. Moreover the elevation-precipitation relationship is analyzed using Standardized Point Cumulative Semivariogram together with cluster analysis techniques, for recognize precipitation patterns.