Using GIS for mapping monthly rainfall in Galicia (NW Spain)

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Rainfall is an intermittent phenomenon which displays a large spatio-temporal variability. The most commonly used interpolation techniques provide good estimates of the total amount of rainfall but they do not model accurately its complex spatio-temporal structure. Better descriptions should be obtained using techniques which take into account its spatial structure. The purpose of this study was to map the total monthly rainfall using GIS approachs. The data set used in this exercise consisted of total monthly rainfall from a maximum of 190 rain gauges irregularly distributed in Galicia, a region of North West Iberian Peninsula. Data sets were referred to 2006. A comprehensive statistical description of the data was carried out. Coefficients of variation ranged from about 30 to 80% showing the high variability of rainfall in the study area; this variability was higher in the dry season, from June to August. Weak correlations between monthly rainfall and altitude were found which impeded to include this ancillary information in a kriging with external drift approach. Estimation and mapping were carried out using a GIS called PCRaster and a digital elevation model of the Galicia region. Inverse distances technique probed to be an appropriate method for a rapid estimation of the rainfall spatial distribution at the scale studied. Spatial dependence analysis showed exponential or spheric structures with different nugget effect depending on the month. Moreover, cross-validation showed that fitted theoretical models described adequatelly the spatial dependence of rainfall. An approach by ordinary kriging was carried out; results from this analysis showed similar patterns to those found by inverse distances. However, kriging maps presented a smoothing of the isohyets.