Spatial Interpolation of hourly precipitation data and rainfall-runoff modeling in JGrass-NewAGE system

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Rainfall data is the main sources of error in many hydrological modelling and other water resource management, and appropriate representation is one of the first steps in hydrological applications. Many rainfall interpolation techniques are available for hydrologist, and which method performs better is the main research question in the field specifically at shorter time scale hydrological model simulation. Taking Posina river basin, Northeast Italy, as case study area, we have compared four geostatistical rainfall interpolations such as Ordinary Krigning (OK), Local Ordinary Kriging (LOK), Detrended Kriging (DK), and Local Detrended Kriging (LDK) performance using cross-validation approach. The impacts of semivariogram on the four kriging interpolation methods is analyzed, and found out that the semivariogram has small impact on kriging performance, whereas the comparison between the kriging interpolation indicates that LDK and LOK are outperform than the OK and DK. The performance of kriging methods increases with the rainfall intensity threshold increases for all the kriging methods. We tried to analyze the uncertainty due to the use of different methods of the spatial interpolation of rainfall data. The hydrological validation of the interpolation methods has also been investigated, which examines the impacts of the four interpolation methods on runoff modeling at the same basin. The hydrological validation of the four kriging interpolations indicates that DK is found to be the best performing method resulting better runoff simulation. All the interpolation and rainfall-runoff modeling are at hourly time step. The spatial interpolation component and rainfall-runoff component of JGrass-NewAGE system are used to carry out geostatistics interpolation and runoff simulation respectively.

Keywords: Rainfall, Interpolation, Kriging, cross-validation, JGrass-NewAGE system