Comparison and hydrological modeling of spatial interpolation schemes for rainfall data at annual, daily and hourly time scale

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Watershed management, disaster prediction and hydrological modeling require data related to very important mater of spatial distribution information of precipitation. However, the use of different interpolation schemes in the same catchment may cause large differences and deviation from the actual spatial distribution of rainfall. Our study aims at analyzing different rainfall spatial interpolation schemes at annual, daily and hourly time scales to give a comprehensive evaluation. In this study, the meso-scale catchment of the Fuhe River in the southeastern of China was selected as a typical region and the principal component regression with residual correction Model (PCRR) between observed precipitation and site geographic information by adding the elevation, slope and aspect as covariate was proposed and compared with Inverse Distance Weighting (IDW), and Multiple Linear Regression (MLR) interpolation methods. Furthermore, a hydrologic model HEC-HMS was used to calculate streamflow and compared with measured runoff in daily and hourly time step by using three interpolation methods as input separately. The result shows the PCRR methods performed better, which could effectively eliminate the interpolation anomalies caused by terrain difference between observation points and surrounding areas. The simulated streamflow showed different characteristics in mean, maximum, minimum, and peak flows, and the PCRR simulation results showed the least streamflow error and good correlationship with the measured process at daily time scale. The application of the PCRR is very promising as it takes multicollinearity among each variable into account.