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The SIA method for spatial analysis of precipitation in the upper-middle reaches of the Yangtze River

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Using geographic information system (GIS) techniques and the newest seasonal and annual average precipitation data of 679 meteorological stations from 1971 to 2000, the multiple regressions equations of the precipitation and topographical variables are established to extract the effect of topography on the annual and seasonal precipitation in the upper-middle reaches of the Yangtze River. Then, this paper uses a successive interpolation approach (SIA), which combines GIS techniques with the multiple regressions, to improve the accuracy of the spatial interpolation of annual and seasonal rainfall. The results are very satisfactory in the case of seasonal rainfall, with the relative error of 6.86%, the absolute error of 13.07 mm, the average coefficient of variation of 0.070, and the correlation coefficient of 0.9675; in the case of annual precipitation, with the relative error of 7.34%, the absolute error of 72.1 mm, the average coefficient of variation of 0.092, and the correlation coefficient of 0.9605. The analyses of annual mean precipitation show that the SIA calculation of 3-5 steps considerably improves the interpolation accuracy, decreasing the absolute error from 211.0 mm to 62.4 mm, the relative error from 20.74% to 5.97%, the coefficient of variation from 0.2312 to 0.0761, and increasing the correlation coefficient from 0.5467 to 0.9619. The SIA iterative results after 50 steps identically converge to the observed precipitation.

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