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# Evaluation of interpolating methods for daily precipitation at various station densities

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Abstract: Spatial continuous data play a significant role in planning, risk assessment and decision making in climate research and geosciences. It is essential to get accurate grid precipitation data of high resolution in hydrological modeling and water resources management. In recent years, radar and satellite provide an alternative way for spatial precipitation data, but due to technique problems and deficient accuracy, interpolating the observed point data is still the common way to obtain gridding precipitation data for research and management purposes. Many interpolating methods have been proposed and great effort has been made to evaluate and compare them. But by far, no universal method is widely accepted because of the diversity in study regions, difference in climate situations, and differences in data quality and quantity, and selected methods in comparisons. It has been well known that the most paramount factor affecting the performance of interpolating methods is the density of sampling points. However, the performance of different interpolating methods at various sampling densities, which means the performance degradation caused by density changes, has not been deeply examined. This work focuses on the evaluation of interpolating methods in daily precipitation at various station densities and tries to provide guidance on choosing interpolating method under different circumstance. To fill this objective, we choose five commonly used or recommended interpolation methods, i.e. nearest neighbor (NN), inverse distance weighting (IDW), Gradient plus Inverse Distance Squared (GIDS), ordinary kriging (OK) and simple kriging (SK) at five designed sampling densities ranging from 22.6 to 9.8 stations per ten thousand square kilometers at Xiangjiang River basin during 2000 to 2005 when the precipitation data were in the highest density. Four criteria were used for method assessment, i.e. mean error (ME), root mean absolute error (RMSE), model efficient (EF) and index of agreement (IOA) via cross-validation. To further observe their performance in interpolating different precipitation parameters, we also analyzed the changes of performance of the five methods in estimating daily maximum precipitation and precipitation values at different quintiles (5%, 25%, 50%, 75% and 95%) with different sampling densities.