An NDVI-based precipitation interpolation to improve hydrology simulation in the Upper Reaches of the Yangtze River

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Abstract Spatially interpolated rainfall estimates from raingauges are widely used as input to hydrological models, but there is no universally suitable interpolation method. In southwest China there are very few rain-gauges. Therefore, geographical information related to rainfall needs to be used in spatial interpolation methods. Among elevation, longitude, latitude, slope, and the normalized difference vegetation index (NDVI), NDVI is found to be the most optimum geographical information indicator for precipitation in the upper reaches of the Yangtze River in China, after carefully analysis. Accordingly, a gradient plus reverse distance squared method based on NDVI was developed and applied in the upper reaches of the Yangtze River from 1956 to 2000. The interpolation result was compared with the result of Countrywide Water Resources Planning. The difference was not too much and the result of the interpolation showed a reasonable precipitation distribution in the mountainous areas, which was greatly improved compared to the direct use of the inverse-distance weighted method (IDW). And then the interpolation result was input to the Water and Energy transfer Process (WEP) model to simulate the hydrological cycle of the basin. The simulation of the hydrological processes show that water quantity balance errors are less than 5% and the Nash-Sutcliffe efficiency coefficient is above 0.7, which prove that the interpolation method presented in this paper is credible.

Key words precipitation; spatial interpolation; NDVI