Rainfall network optimization based on information theory and temporal variability analysis

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Rainfall network system is a fundamental hydrological monitoring and data collection system. The interaction and dependent structure of the rainfall stations in the system are of great significance to the establishment of spatial rainfall analysis. Also, hydrological model demands representative and accurate rainfall input, which relies on reasonable rainfall monitoring network. Information theoretic measures are especially suitable for characterizing and quantifying the relationship between rainfall stations in the network system. Here we propose a framework coupling information theory and temporal variability analysis for the optimization of rainfall network system. We study sliding time series under changing environment and conduct rainfall network optimization using different time windows. Shanghai is a typical area influenced by subtropical monsoon climate in China, and study of rainfall characteristics in this area is particularly valuable and important for reasonable utilization and planning of water resources, as well as efficient hydrological forecasting under changing environment. Based on daily rainfall data (2006-2015), we optimize rainfall network and detect network behavior shifts under changing seasons. Differences in spatial distribution of the optimal networks suggest that optimizing the rainfall network for changing meteorological conditions may be more recommended.