Investigation of organized hydrological heterogeneity from a spatial analysis perspective

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Abstract  Spatial analysis as a framework for exploring spatial patterns is well known in social-geography, econometrics and other fields, but has seldom been applied in catchment hydrology. This paper presents a new method for the investigation of the spatial patterns of hydrological variables from a spatial analysis perspective. Using the topographic index (TI) as an example, the preliminary yet promising results obtained from this analysis suggest that the Global Moran’s I index constructed from an asymmetric inverse flow distance weight matrix is an effective bulk signature of hydrological spatial structure, and the Local Indicator of Spatial Association (LISA) captures well the transition from hydrological heterogeneity to hydrological homogeneity with increasing spatial scale. These results suggest that complementary to existing statistical methods, spatial analysis could be a promising framework for quantifying and modelling spatial patterns exhibited by hydrological variables.

Key words  Spatial analysis; TI; Global Moran’s I; asymmetric inverse flow distance weight matrix; LISA