

## **A new GIS-based algorithm for computing the TOPMODEL topographic index**

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**Abstract** The TOPMODEL topographic index (TI), frequently used in approximately characterizing the spatial distribution of soil moisture, surface saturation, and runoff generation processes within a watershed, has been widely used in some topography-related geographical processes and hydrological models. However, it is still questionable whether the current GIS-based algorithms of TI can effectively control the local topographic characteristics and correctly indicate the spatial distributions of soil moisture and surface saturation. Based on the commonly used multiple flow direction (MFD) approach, we proposed a new improved multiple flow direction (IMFD) algorithm for accurately computing the TI distribution from DEM in this study. Then the new algorithm is applied to a real catchment located upstream of the Hanjiang River in China. Subsequently, the IMFD algorithm is quantitatively evaluated by using four types of artificial mathematical surfaces. Assessing the results shows that the error generated by IMFD is lower than that computed by the commonly used MFD algorithm, and the IMFD algorithm can more correctly express the relationship of upslope contribution area and soil water content and more accurately reflect the hydrological similarity of watersheds in TOPMODEL.

**Key words** topographic index; TOPMODEL; DEM; GIS; multiple flow direction algorithm