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Determining the Transition Reaches between Torrents and Rivers Using Longitudinal and Cross-Sectional Channel Morphology

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Channel characteristics such as channel width, slope, bed material size, vary gradually from headwaters to downstream rivers. In contrast to downstream rivers, streams in upper catchments (or so-called torrents) have steeper slope, smaller width-depth ratio and higher fluctuation of flow discharge. From a perspective of natural disasters in orogenic belts, debris flows often occur in torrents while floods are the major disaster in downstream areas. Investigating and identifying the transition reaches between torrents and rivers not only explore the geomorphological meanings but also contribute to watershed and disaster management. Previous river classification methods used longitudinal (ex. channel slope) or cross-sectional (ex. width-depth ratio) index to describe the various river types. We proposed a notch index combined the two values to determine transition reaches based on a high-resolution DEM for 50 river channels in Taiwan. The results show that the transition reaches generally occur in the channel slope between 0.03 and 0.10. However, their altitudinal distribution differs by regions. The elevation of transition reaches in rivers in eastern Taiwan is about 500 m whereas 1500 m in western Taiwan. Rivers in southeast part has no transition reaches due to the low relief landscape. Transition reaches identified by this method is reasonable after comparison with satellite images and applicable for river management by related authorities.