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Clustering stream profiles to understand the geomorphological features and evolution of the Yangtze River by using DEMS

Fei Zhao^{1,2,3} and Liyang Xiong^{1,2,3}

¹Key laboratory of Virtual Geographic Environment, Ministry of Education, Nanjing Normal University; Nanjing 210023, China

²School of Geography, Nanjing Normal University, Nanjing, 210023 China

³Jiangsu Center for Collaborative Innovation in Geographical Information Resource Development and Application, Nanjing 210023, China

Stream morphology is an important indicator for revealing the geomorphological features and evolution of the Yangtze River. Existing studies on the morphology of the Yangtze River focus on planar features. However, the vertical features are also important. Vertical features mainly control the flow ability and erosion intensity. Furthermore, traditional studies often focus on a few stream profiles in the Yangtze River. However, stream profiles are linked together by runoff nodes, thus affecting the geomorphological evolution of the Yangtze River naturally. In this study, a clustering method of stream profiles in the Yangtze River is proposed by plotting all profiles together. Then, a stream evolution index is used to investigate the geomorphological features of the stream profile clusters to reveal the evolution of the Yangtze River. Based on the stream profile clusters, the erosion base of the Yangtze River generally changes from steep to gentle from the upper reaches to the lower reaches, and the evolution degree of the stream changes from low to high. The asymmetric distribution of knickpoints in the Han River Basin supports the view that the boundary of the eastward growth of the Tibetan Plateau has reached the vicinity of the Daba Mountain.