

Intra-annual Spatiotemporal Migration of the Main-channel in the Braided Reach of the Lower Yellow River

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Abstract

Main-channel migration reflects the stability and adjustment of braided rivers, yet its intra-annual spatiotemporal variation remains poorly quantified in the braided reach of the Lower Yellow River (LYR). Using Sentinel-2 imagery from 2018 to 2022, this study developed a method based on the Euclidean Distance Transform (EDT) to extract the main-channel centerline and quantify its migration width in a multi-channel river. Results confirmed that main-channel migration was highly episodic and mainly concentrated during the flood season, with additional adjustment in some reaches after the flood period. Spatially, the most active migration was concentrated from Mayugou to Guanzhuangyu and from Heishi to Youfangzhai, where the channel was relatively wide and multi-threaded. Finally, an empirical model was established to predict reach-scale migration width from mean discharge, incoming sediment coefficient, and interval duration. Calibration with 2018–2021 data and validation with 2022 data yielded relative root mean square errors of 23% and 36%, respectively. This study provides a remote-sensing-based framework for quantifying short-term planform adjustment of braided rivers and improves a basis for river regulation and channel-stability assessment in the LYR.

Keywords

Euclidean Distance Transform, Main-channel Centerline, Migration Width, Lower Yellow River, Braided River