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Dynamic Change of Floods Disaster Monitoring for River Central Bar by Remote Sensing Time-Series Images

Authors : Zuoji Huang, Jinyan Sun, Chunlin Wang, Haiming Qian, Nan Xu

Abstract : The spatial extent and area of central river bars can always vary due to the impact of water level, sediment supply and human activities. In 2016, a catastrophic flood disaster caused by sustained and heavy rainfall happened in the middle and lower Yangtze River. The flood led to the most serious economic and social loss since 1954, and strongly affected the central river bar. It is essential to continuously monitor the dynamics change of central bars because it can avoid frequent field measurements in central bars before and after the flood disaster and is helpful for flood warning. This paper focused on the dynamic change of central bars of Phoenix bar and Changsha bar in the Yangtze River in 2016. In this study, GF-1 (GaoFen-1) WFV(wide field view) data was employed owing to its high temporal frequency and high spatial resolution. A simple NDWI (Normalized Difference Water Index) method was utilized for river central bar mapping. Human-checking was then performed to ensure the mapping quality. The relationship between the area of central bars and the measured water level was estimated using four mathematical models. Furthermore, a risk assessment index was proposed to map the spatial pattern of inundation risk of central bars. The results indicate a good ability of the GF-1 WFV imagery with a 16-m spatial resolution to characterize the seasonal variation of central river bars and to capture the impact of a flood disaster on the area of central bars. This paper observed a significant negative but nonlinear relationship between the water level and the area of central bars, and found that the cubic function fits best among four models ($R^2 = 0.9839$, $P < 0.000001$, RMSE = 0.4395). The maximum of the inundated area of central bars appeared during the rainy season on July 8, 2016, and the minimum occurred during the dry season on December 28, 2016, which are consistent with the water level measured by the hydrological station. The results derived from GF-1 data could provide a useful reference for decision-making of real-time disaster early warning and post-disaster reconstruction.

Keywords : central bars, dynamic change, water level, the Yangtze river
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