

Study of Morphologic Change in Poyang Lake Basin Caused by Sand Dredging Using Multi-temporal Landsat Images and DEMs

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ABSTRACT:

Sand dredging has been practiced in rivers, lakes, harbours and coastal areas in recent years in China mostly because of demand from construction industry as building material. Sand dredging has disturbed aquatic ecosystems by affecting hydrological processes, increasing content of suspended sediments and reducing water clarity. Poyang Lake, connecting with Yangtze River in the lower reaches of the Yangtze River, is the largest fresh water lake in China. Sand dredging in Poyang Lake has been intensified since 2001 because such practice was banned in Yangtze River and profitable. In this study, the morphologic change caused by sand dredging in Poyang Lake basin was analysed by overlaying two DEMs acquired in 1952 and 2010 respectively. Since the reflectance of middle infrared band for sand dredging vessel is much higher than that of water surface, sand dredging vessels were showed as isolated gray points and can be counted in the middle infrared band in 12 Landsat images acquired in flooding season during 2000~2012. Another four Landsat images (1 medium water level image and 1 low water level image before 2000 and after 2010) were used to evaluate the morphologic change by comparing inundation extent and shoreline shape. The following results was obtained: (1) vessels for sand dredging are mainly distributed in the north of Poyang Lake before 2008, but the dredging area was enlarged to the central region and even to Gan River; (2) sand dredging area reached to about 260.4 km² and is mainly distributed in the north of Songmen Mountain and has been enlarged to central of Poyang Lake from the distribution of sand vessels since 2008. Sand dredged from Poyang Lake was about $1.99 \times 10^9 \text{m}^3$ and 330Mt. It means that all sand depositions in Poyang Lake during 1955-2010 (about 244Mt) were dredged out in the ten years during between 2001 and 2010; (3) Sand dredging in Poyang Lake has alternated the lake capacity and discharge section area, sawtooth-shaped shoreline was also caused by the practice. This study is useful to understand the change of hydrological system, especially the drying up trend in Poyang Lake in recent autumns and winters.