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Characteristics of Large-Scale Harmful Algal Blooms (HABs) in the Yangtze River Estuary and the Adjacent East China Sea (ECS) from 2000 to 2010

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ABSTRACT

Harmful algal blooms (HABs) are a serious worldwide issue which has posed great risks on marine ecosystems and public health by directly releasing toxins or indirectly leading to anoxia in marine environment. In recent years HABs have caused huge economic losses in China, particularly in the Yangtze Estuary and the adjacent East China Sea (ECS). The present study investigated the spatial-temporal and species characteristics of large-scale HABs in this area using geographic information system (GIS) Kernel Density Estimation (KDE) spatial analysis, statistical methods and satellite image interpretation. Results revealed that the Yangtze Estuary, Zhoushan island, Xiangshan bay and Jiushan island are the regions with highest frequency of large-scale HABs. HABs in the ECS reached a peak in terms of total number and area in 2003 to 2005 and occupied a high percentage (around 70% in area and 60% in occurrence) in the four Chinese coastal waters. The number of large-scale HABs (> 1000 km²) in the Yangtze Estuary and the adjacent ECS declined after 2005 while that of HABs (> 100 km²) declined after 2008. Large-scale HABs occurrences concentrated in summer (May to July), and the averaged duration increased continually from the shortest time (1.3 days) in 2001 to the longest (10.9 days) in 2010 for each HAB. 17 causative species were found with *Prorocentrum dentatum* as the most frequent dominant species, followed by *Skeletonema costatum*, *Karenia mikimotoi*, and *Chaetoceros curvisetus*. Water discoloration observed in MODIS satellite true color images was well consistent with the corresponding HABs reported by State Oceanic Administration of China (SOA). Multiple factors involving eutrophication, physical dynamics, topography and deposition conditions contributed to the formation of frequent HABs in the ECS. Three strategies including establishing a synthesized system, improving the previous database and investigating multiple contributors were proposed for future HABs monitoring and management.

KEYWORDS

Harmful Algal Blooms (HABs), Yangtze Estuary, the East China Sea, Spatial and Temporal Characteristics, Causative Species, Remote Sensing

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