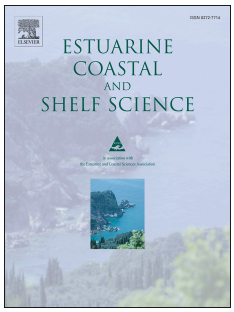
Accepted Manuscript



GF-1 and Landsat observed a 40-year wetland spatiotemporal variation and its coupled environmental factors in Yangtze River estuary

Nan Sun, Weining Zhu, Qian Cheng

PII: S0272-7714(17)30472-9

DOI: 10.1016/j.ecss.2018.03.022

Reference: YECSS 5799

To appear in: *Estuarine, Coastal and Shelf Science*

Received Date: 11 May 2017

Revised Date: 27 February 2018

Accepted Date: 28 March 2018

Please cite this article as: Sun, N., Zhu, W., Cheng, Q., GF-1 and Landsat observed a 40-year wetland spatiotemporal variation and its coupled environmental factors in Yangtze River estuary, *Estuarine, Coastal and Shelf Science* (2018), doi: 10.1016/j.ecss.2018.03.022.

GF-1 and Landsat observed a 40-year wetland spatiotemporal variation and its coupled environmental factors in Yangtze River estuary

Nan Sun[1] Weining Zhu[2] Qian Cheng[3]

1. Institute for Island and Coast Research, Ocean College, Zhejiang University, Zhoushan, China
2. Department of Marine Information Science, Ocean College, Zhejiang University, Zhoushan, China
3. School of Tourism and Urban-Rural Planning, Zhejiang Gongshang University, Hangzhou, China

Abstract

Wetlands are health indicators of aquatic ecosystems and also vulnerable to regional environmental and socio-economic changes. For exploring wetland spatiotemporal variations in estuarine and coastal regions of the Yangtze River, we extracted wetland information from 40-year time-series images of Landsat, GF-1, and other satellites, using the classification method of decision tree. Potential environmental and socio-economic factors which may drive wetland variations were analyzed. Results show that the wetland area in Yangtze River estuary has increased 663 km^2, but it was only contributed by the increasing of human-made wetlands (767 km^2), which were mostly caused by economic growth and constructions of human-made hydro-projects in Yangtze Delta. In comparison, natural wetlands, such as tidal flats and marshes, have decreased 163 km^2. Land reclamation has changed these natural wetlands into reservoirs, aquaculture ponds and paddy fields. Wetlands in Shanghai and Qidong urban regions were mainly affected by human activities, while wetland variations in Chongming Island were mainly controlled by natural factors such as the upstream discharge, precipitation, diurnal variation of tidal level and long-term sea level rising. The general trend is that the natural wetland was transformed into the human-made wetland, and the human-made wetland was transformed into construction land.

Key words: Wetland; Yangtze River estuary; remote sensing; long-time series; spatiotemporal variations; driving factors

1 Introduction

As the most productivity ecosystem of the globe, wetlands imply abundant biological diversity and vitality (Barbier et al., 2011). The value of global ecosystem services in 2011 was $125 trillion/yr, of which 45% was contributed by wetlands and coasts (Costanza et al., 2014). Wetlands play a critical indicator of global climate change – they contain approximately 12% of the global carbon pool and contribute more than 10% of the annual global CH_4 emissions (Solomon, 2007), and hence affect greenhouse gas concentrations (Zedler and Kercher, 2005). Additionally, known as the kidney of the earth, wetlands bear irreplaceable functions for flood reduction, pollutant degradation, and environmental amenity (Keddy, 2010; Reddy and D'angelo, 1997). Because of a variety of natural and human influences, however, wetlands are now suffering from serious losses related to global warming, sea level rising, and other environmental factors and anthropogenic activities (An et al., 2007; Day et al., 2008). Many countries and organizations have made a lot of laws and actions to protect and restore wetlands. After GlobWetland projects