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RESEARCH ARTICLE

Rice cultivation changes and its relationships with geographical factors in Heilongjiang Province, China



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Abstract

Rice planting patterns have changed dramatically over the past several decades in northeast China (NEC) due to the combined influence of global change and agricultural policy. Except for its great implications for environmental protection and climate change adaptation, the spatio-temporal changes of rice cultivation in NEC are not clear. In this study, we conducted spatio-temporal analyses of NEC's major rice production region, Heilongjiang Province, by using satellite-derived rice cultivation maps. We found that the total cultivated area of rice in Heilongjiang Province increased largely from 1993 to 2011 and it expanded spatially to the northern and eastern part of the Sanjiang Plain. The results also showed that rice cultivation areas experienced a larger increase in the region managed by the Reclamation Management Bureau (RMB) than that managed by the local provincial government. Rice cultivation changes were closely related with those geographic factors over the investigated periods, represented by the geomorphic (slope), climatic (accumulated temperature), and hydrological (watershed) variables. These findings provide clear evidence that crop cultivation in NEC has been modified to better cope with the global change.

Keywords: paddy rice, spatio-temporal change, cultivation area, geographical factors

1. Introduction

Paddy rice is one of the three major grain crops in China and it accounts for 27% of the total area allocated to grain

crops and 35% of the total food production nationally (Xiao *et al.* 2006; Li *et al.* 2017). In recent decades, rice cultivation in China has undergone significant changes, particularly in Heilongjiang Province of the northeast China (NEC), driving by numerous factors including climate change, government policies and market prices (Kontgis *et al.* 2015; Li *et al.* 2016). It is estimated that rice production in Heilongjiang has grown from 3 to 13% of the total amount of rice production in China over the past 30 years, mainly due to the rapid expansion of rice planting areas (Xia *et al.* 2014). This kind of dramatic changes in rice cultivation would bring great impacts on agricultural and environmental sustainability, food and water security, as well as greenhouse gas emissions (Sakamoto *et al.* 2006; Yu *et al.* 2017). It is thus of great implications to understand the characteristics,

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