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Multi-year monitoring of paddy rice planting area in Northeast China using MODIS time series data

基于MODIS时间序列的东北地区水稻种植区监测

Key words: Paddy rice, Moderate resolution imaging spectroradiometer (MODIS), Northeast China, Enhanced vegetation index, Land surface water index

关键词：水稻；中等分辨率成像光谱仪(MODIS)；增强型植被指数；地表水指数

- Northeast China is the major japonica rice producing region in China. Monitoring and mapping of paddy rice is very important for food security assessment and planning, environmental sustainability, and government decision making.

- Steady progress has been made toward monitoring crop growth conditions and estimating crop yield with remote sensing techniques for several decades.

- Paddy rice fields are usually prepared by flooding a few days before rice seedlings are transplanted and have at least one wet growing season in shallow flood water. Spectral bands or spectral indices, which are sensitive to both water and vegetation, are necessary for monitoring changes in the mixture of surface water and green vegetation in paddy rice fields.

- The SWIR band centered at 2130 nm is less affected by ozone and Rayleigh scattering, water vapor, and aerosols than that at 1640 nm and has a good response to cumulative rainfall.

- The aim of this study was to propose an algorithm for detection and estimation of the transplanting and flooding periods of paddy rice with a combination of EVI and land surface water index with a central wavelength at 2130 nm ($LSWI_{2130}$).

- With the validation of paddy rice distribution derived from fine resolution imagery (Landsat TM) at two intensive sites, the user's and producer's accuracies were both approximately greater than 80% at the block level (3×3 pixel moving window).

- The total planting area of paddy rice in Northeast China identified using the MODIS-based algorithm has a significant correlation (R^2=0.847) with the sown area of paddy rice described in the statistical yearbook from 2001 to 2009.

- It also revealed a sudden decline in 2003, especially in Sanjiang Plain located in the northeast of Heilongjiang Province.

- The results suggest that the approaches are available for accurate and reliable monitoring of rice cultivated areas and variation on a large scale.