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Mapping regional cropping patterns by using GF-1 WFV sensor data

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Abstract

The successful launched Gaofen satellite no. 1 wide field-of-view (GF-1 WFV) camera is characterized by its high spatial resolution and may provide some potential for regional crop mapping. This study, taking the Bei'an City, Northeast China as the study area, aims to investigate the potential of GF-1 WFV images for crop identification and explore how to fully use its spectral, textural and temporal information to improve classification accuracy. In doing so, an object-based and Random Forest (RF) algorithm was used for crop mapping. The results showed that classification based on an optimized single temporal GF-1 image can achieve an overall accuracy of about 83%, and the addition of textural features can improve the accuracy by 8.14%. Moreover, the multi-temporal GF-1 data can produce a classification map of crops with an overall accuracy of 93.08% and the introduction of textural variables into multi-temporal GF-1 data can only increase the accuracy by about 1%, which suggests the importance of temporal information of GF-1 for crop mapping in comparison with single temporal data. By comparing classification results of GF-1 data with different feature inputs, it is concluded that GF-1 WFV data in general can meet the mapping efficiency and accuracy requirements of regional crop. But given the unique spectral characteristics of the GF-1 WFV imagery, the use of textual and temporal information is needed to yield a satisfactory accuracy.

Keywords: crop mapping, GF-1, object-based, Random Forest

1. Introduction

Crop pattern is commonly required for the estimation of land cover mapping and monitoring and is important for food security and agrarian policy relevant to rural investment and development policy (Wu *et al.* 2014b). As such, the demand for accurate and efficient crop pattern maps is increasing internationally (Zhong *et al.* 2014). In addition, the spatial distribution and temporal dynamics of crop planting patterns have great implications in the understanding of the changing climate and the overall agricultural response to environmental issues (Wu *et al.* 2014a; Yu *et al.* 2014). Therefore, crop pattern information is frequently updated for the major cropland regions in China.

Earth observation satellites have proven to be an effective tool for land use mapping and crop classification (Castillejo-González *et al.* 2009). The satellite images, which are used for crop identification, range from low to high spatial resolutions (Wardlow *et al.* 2007; Hong *et al.* 2011), and the spatial resolution normally are chosen relative to the typical field

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