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基于MODIS NDVI多年时序数据的农作物种植识别

Crop information identification based on MODIS NDVI time-series data

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中文摘要:

为了获取陕西省农作物种植模式和类型分布信息，实现对于多年农作物长势分析及精确的估产和耕地生产力的估算，该文以2003－2012年的MOD09Q1时间序列遥感数据集为数据源，以陕西省主要农作物冬小麦、夏玉米、春玉米、水稻和油菜为研究对象，利用Savitzky-Golay滤波方法重建NDVI长时间序列数据集，充分利用农作物的物候信息，构建农作物年际间动态阈值方法，实现了农作物种植模式和类型的识别。通过对混合像元进行分解，更精确地提取农作物种植面积信息。利用空间和定量2种方式对农作物类型识别结果进行分析验证，空间对比分析得到分类的总体精度和Kappa系数为88.18%和59.64%，定量对比分析得到分类的总体一致性为87.56%。研究结果表明，结合物候信息与时间序列数据利用该文的分类方法可以有效的识别大尺度农作物信息。

英文摘要:

Abstract: Arable land is the foundation of the national economy. How to make the best of arable land resources has become a focus problem of modern science and technology information. The rapid development of agricultural condition remote sensing monitoring technology provides more scientific ways and information technology for monitoring the arable land in real-time. In order to obtain the information of Shaanxi Province agricultural condition monitoring for managing arable land more efficiently, this thesis aimed to study the crop planting patterns and types of arable land, and took the main crops (wheat, spring maize, summer maize, rice and rape) of arable land in Shaanxi Province as the research object.Firstly, the remote sensing datasets of 250 m MOD09Q1 time series during 2003-2012 were used, and the Savitzky-Golay filtering method of TIMESAT software was used to reconstruct the NDVI time series datasets. Secondly, combined with the agricultural meteorological station datasets, TM 30 m land cover classification data, and the main crops' information and crop phenological information in Shaanxi Province, we extracted the change trends of typical terrain feature and determined the interannual dynamic thresholds. According to the threshold of a peak and crop growth period and other information, the crop planting patterns and crop types were identified. Thirdly, owing to the mixed pixel that the major factor affected the classification accuracy of the low spatial resolution remote sensing, therefore, the IDL optimization function (CONSTRAINED_MIN) was used to obtain each crop types' abundance figure by the method of non-negative least squares.Two kinds of precision validation methods of spatial and quantitative were adopted in this paper. The total classification accuracy and Kappa coefficient were 88.18% and 59.64% respectively according to spatial comparative analysis. The classification results were revised by the crop types' abundance figure, and the overall consistency of classification was 87.56% according to quantitative analysis, and the validation results for the rice and other grains had good consistency (93.74%, 92.36%), while the winter wheat and maize followed (83.68%, 84.61%). Through the analysis of mixed pixels, the overall consistency of estimating crop acreage increased by 6.23%, the consistency of winter wheat, maize, rice and other grains increased by 6.35%, 8.01%, 7.26% and 4.85%.The results indicate that using the Savitzky-Golay filtering method to reconstruct NDVI time series datasets could meet the requirement of the classification. Combining phonological information with time series datasets and using the classification method presented in this thesis could identify the crop planting patterns and crop types effectively in large scale. Using the IDL optimization function (CONSTRAINED_MIN) to analyze the mixed pixels, the crop acreages were calculated accurately.

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