Classification of Winter Wheat using high spatial resolution data in North China Plain

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Winter Wheat in North China Plain (NCP) is one of the key food sources for securing food safety of China. Mapping the spatial distributions of winter wheat plays crucial roles in monitoring of planting areas and estimation of winter wheat production, which is usually carried out through classification of satellite images. The traditional classification methods are mainly based on data collection, download storage, and local analysis. However, these approaches are not capable of dealing with the quick mapping of massive satellite data including high spatial-temporal resolutions over large-scale areas. To overcome this challenge, this study developed a processing chain for mapping winter wheat of NCP at 10 m resolution using Sentinel-2-based NDVI time series on the google earth engine (GEE) platform, a cloud computing platform for Earth science data and analysis. First, the influence of phenology between the north and the south of the NCP on classification is eliminated by using the locally selected training data sets. Second, the data contaminated by clouds were all removed. Third, the training sample sets are constructed, and the typical features are searched. Last, two machine learning algorithms were applied to yield the classification result map, that is, Random Forest (RF) method and Regression Trees (CART) method. Validation results showed that the final maps and classification accuracy of RF method was better than SVM and CART method, with total accuracy of 81%. Moreover, this study also demonstrated that the GEE platform can yield dramatically higher efficiency than conventional classification methods by reducing downloading time and local storage capacity. Consequently, we recommend that the GEE cloud computing platform is a more suitable research tool for large-scale geospatial analysis and application.

Keywords: Google earth engine, Cloud computing, Big data, Classification, Sentinel-2, Winter wheat