Crop Mapping with combined use of European and Chinese Satellite Data

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Abstract: In the big data era, various kinds of satellite data are increasingly made easily and/or freely available in the world. Therefore, the crop type mapping with these satellite data has strongly attracted the attention from the remote sensing researchers. As a new comer, the Chinese high resolution satellite series, short name for GF, are being developed in China. GF-1 data has a 16 meters ground sampling for 4 bands, such as blue, green, red and near infrared spectra. In Europe, the Copernicus project ensures the stable Sentinel satellite series and provides multispectral and 10-meter resolution optical satellite images to the worldwide end users. These satellite images become the rich data sources for the crop type mapping with the machine learning algorithm nowadays. In support of the provincial agricultural monitoring, we have developed an approach to use GF, Sentinel 2 and other third partner satellite images to mapping crop types in irrigation area of the yellow river of Ningxia, China. Field sample photos were taken with the GPS camera in summer 2017 and 2018 respectively and thereafter the crop types for the ground truth data were interpreted with a software, named GPS Photo Data Processor. With the support of these ground truth samples, more samples for the training and validation were further visually added over a clear sky image in key crop growth stage. The Random Forest was used as the classifier for this study as many literatures have reported that the RF algorithm overperformances other algorithms in many cases, such as SVM, Maximum Likelihood. The classification results of crop type map were evaluated with the error confusion matrix, in particular, OA(overall accuracy) and F1 Score. Sentinel 2A/B images during the growing season in 2017 and 2018 were collected and processed via the ESA Sent2Agri system that UCL developed. The GF satellite images were collected from CRESDA in China. All these data were further processed and finally made spatially congruent. The performance for crop type mapping with time series of each of these data sources was analyzed and compared. The results show that the accuracies were between 84-93%. The accuracy of crop type mapping with GF data was the lower due to less bands and other limitations. The accuracy of crop type mapping with all bands of Sentinel 2A/B reached the highest due to more key bands and higher resolution. The utilization of huge volume of the high resolution satellite images, such as Sentinel 2 is challenging to the researchers.

Keywords: Crop Mapping, Classification, GF, Sentinel, Sent2Agri, Dragon Program