Geophysical Research Abstracts
Vol. 16, EGU2014-3540, 2014
EGU General Assembly 2014

Rice crop monitoring with multitemporal MODIS-Landsat data fusion

Cheng-Ru Chen (1), Chi-Farn Chen (2), and Nguyen-Thanh Son (3)

(1) Department of Civil Engineering, National Central University, Jhongli, Taiwan (ccruncu@gmail.com), (2) Center for Space and Remote Sensing Research National Central University, Jhongli, Taiwan (cfchen@csrsr.ncu.edu.tw), (3) Center for Space and Remote Sensing Research National Central University, Jhongli, Taiwan (ntsonait@hotmail.com)

Rice is one of the most important cereal crops in the world and is the major crop in Taiwan. However, it is a challenge because rice fields are generally small and fragmental, while crop mapping requires information of crop phenology associating with the high spatiotemporal resolution of remote-sensing data. This problem can be partially overcome by a spatiotemporal fusion to create a new dataset that has a better spatiotemporal resolution. In this study, the Moderate Resolution Imaging Spectroradiometer (MODIS) and Landsat imageries were used because MODIS data, which a spatial resolution of land bands of 500 m and temporal resolution of $1-2$ days, were able to achieve the phenological information of rice crops at a large region; while Landsat data demonstrate the effectiveness to collectively map small patches of crop fields at the subnational level due to its spatial resolution of 30 m. However, the temporal resolution of Landsat data is lower (16 days), making it difficult to investigate temporal responses of crop phenology from rice fields. The main objective of this study was to take into account of advantages of MODIS and Landsat imageries to generate a synthetic dataset at Landsat spatial resolution and MODIS temporal resolution for rice crop mapping in Taiwan. The methodology comprised five steps: (1) satellite data for 2011 were pre-processed to account for geometric and radiometric correction of MODIS and Landsat data, (2) MODIS-Landsat data fusion using the Spatial Temporal Adaptive Fusion Model (STARFM), (3) construct the smooth time-series Normalized Difference Vegetation Index (NDVI) data using wavelet transform, (4) rice crop classification using phenological information of crop phenology, and (5) accuracy assessment. The data fusion results for day of year (DOY) 153 were compared with the reference Landsat data (DOY 153) indicated a close correlation (R2 = 0.81). The phenology-based classification results compared with the ground reference data revealed close agreement between these two datasets. The overall accuracy and Kappa coefficient were 82% and 0.75, respectively. The relationship between the MODIS-derived rice areas and those from the government's rice area statistics at the district level was examined, reaffirming a strong correlation between the two datasets with R2 > 0.9. This study demonstrates advantages of MODIS-Landsat data fusion for rice crop mapping in Taiwan. Such an approach used in this study could be applied for other regions to map small patches of crops at a subnational scale.