**Using satellite-based phenology data for rice crop phenology estiomation**

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**Abstract:**Information on the rice crop phenology is important for rice crop monitoring, including crop management and mapping. However, due to small and fragmentary rice field, high spatiotemporal resolution of satellite data is needed for rice crop monitoring. Taking the advantages of the high temporal resolution of MODIS data and the moderate spatial resolution of SPOT data, this study aims to fuse resampled 30m SPOT data with 8-day MODIS 500m data to produce 8-day synthetic imagery at 30m spatial resolution using the spatial-temporal adaptive reflectance fusion model (STARFM) for rice crop phenology estimation. The case study was carried out in western Taiwan in 2011. The data with radiometric and geometric corrections were pre-processed using the STARFM for producing multitemporal synthetic imagery. The following steps were: (1) constructing time-series NDVI data, (2) filtering noise from the time-series data using empirical mode decomposition(EMD), (3) detecting rice crop phenology (sowing, heading, and harvesting dates), and (4) verifying the results using field survey data. The fusion results verified by pixel-by-pixel comparisons for vegetation areas indicated a good agreement between the synthetic image and the actual SPOT image (R2 > 0.8). The smooth NDVI profiles can show the temporal characteristics of rice crop phenology visually. The root mean squared error (RMSE) for the field survey data and estimateted rice crop phenology dates (sowing and harvesting dates) were 10.2 and 11.3, respectively, and which were within the reasonable error ranges for 8-day interval. This study demonstrates the effectiveness of data fusion using MODIS and SPOT for investigating rice crop phenology in western Taiwan. Moreover, the information of rice crop phenology produced from this study would be further used for studies of rice crop mapping and monitoring.

Keyword: Phenoloy, SPOT,MODIS,STARFM,Taiwan