

結合物候特徵與植被結構之自動化地物分類模型
**Developing an automated phenology classification model
(APCM) to identify the land-use and land-cover changes
based on dynamics of vegetation indices and canopy
structure**

Meng-Hsuan Lin^{a, c}, Ying-Tong Lin^b, Yi-Ying Chen^{a*}, Hsueh-Ching Wang^c, and Chi-Kuei Wang^d

^a *Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan;*

^b *Department of Geography, Durham University, Durham, UK;* ^c *Department of Earth and Life Science, University of Taipei, Taipei, Taiwan;* ^d *Department of Geomatics, National Cheng Kung University, Tainan, Taiwan;* ^e *now at Geographic Information Science & Technology, Georgia Institute of Technology, Atlanta, USA*

Abstract

Taiwan's geographical location, simultaneously residing within the subtropical and tropical climate zone, and regional diversity in topography result in a diverse range of climate, precipitation, and temperature suitable for the cultivation of different crops. Diverse vegetation cover and land-use have posed challenges to the accuracy of land-use classification through multispectral remote sensing images. For example, paddy fields and dry agricultural land misclassification (paddy fields as water; dry agricultural land as bare soil) and irrigation pond area uncertainty, caused by weather, algal bloom, and management, are some reasons causing classification errors in Taiwan.

In this study, we utilized the advantage of land-cover seasonality change and established an Automated Phenology Classification Model (APCM), classifying SPOT images, based on phenology, into a total of six land-cover types – forest, built-up land (including bare soil), water, agricultural land, grassland/shrubs, and unknown/unclassified. Through analysing monthly Normalized Difference Vegetation Index (NDVI), and Near Infrared (NIR) values, the temporal characteristics of each land type are detected and used as indexes of classification. 2013-2022 classification results of Taoyuan, Taiwan, demonstrate land area fluctuations over the years – with stable forest and water area change, overall slight decline in agricultural land, and increase in grassland/shrubs. The results also show a negative correlation in area change between grassland/shrubs and agricultural land, and a positive correlation between irrigation ponds and agricultural land. APCM aims to alleviate the time and effort of manual classification. The temporal transferability of the model facilitates analysis of long-term trends of land-use and land-cover change (LULCC), and the spatial transferability enables the classification of Taoyuan to be extended to the entire extent of Taiwan.

Keywords: SPOT images, remote sensing, land-cover classification, land-use classification