Suggested Topic: 3. Remote Sensing Applications/ - Forestry /Ecosystem Destruction

Tropical forest change detection by a

trend analysis of time series satellite images

Gen Takao\*1\*2, Khali Aziz Hamzah\*3, Azahari Mohd Faidi\*3, Hamdan Omar\*3

\*1 Proposed Presenter, \*2 Forestry and Forest Products Research Institute, Tsukuba 305-8687, Japan, takaogen@affrc.go.jp, \*3 Forest Research Institute Malaysia, FRIM Kepong, 52109 Selangor, Malaysia

Preference between oral and poster presentation: Oral

Keywords: Landsat, Cloud-free images, Multilinear regression, Virtual time series images, Peninsular Malaysia

Abstract

Time series Landsat images can be used retrospectively to map land covers and their changes over decades. In humid tropics, however, clouds and uneven hazes have often reduced chances of observing a wide area simultaneously. The objective of this study is to develop a virtual regular-interval time series of cloudless satellite images in a tropical forest area and map the forest changes through the time. In total, 317 Landsat TM/ETM+ images taken in 1994-2012 were used for the analyses (Path: 126 & 127, Row: 057 & 058), which covered about 90,000 km2 of a part of Peninsular Malaysia. As pre-processings, clouds and their shadows were removed, and a dark-vegetation based atmospheric correction was applied for each image. Then, all the images were overlaid to each other after projected to Rectified Skew Orthomorphic Malaya Grid (RSO). For each pixel, trend of the reflectance for Bands 3, 4 and 5 were analyzed against the acquisition dates by multilinear regression, and abrupt land cover changes were detected by fitting multiple regression lines and selecting the best fitting model by the Bayesian Information Criterion, then finally a virtual annual TM/ETM+ images in 1996-2010 was obtained. Each of the annual images was then classified into Forest, Non-forest, Plantations and Water by the classification tree. The overall accuracy was 72.5%. By visual checking, the annual TM/ETM+ images were smooth both geographically and chronologically, and the resultant classification demonstrates virtually no unrealistic land cover changes, e.g. from Forest to Non-Forest then to Forest in a short period. The annual land cover maps indicate a trend of increasing Non-Forest and Plantations while reducing Forest in the area during the period. By using the virtual time-series images, land cover mapping and change detections can become standardized and simplified.