Environmental Monitoring in East Asia: Remote Sensing and Forests

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第５章　地球科学とリモートセンシング国際会議 (IEEE-IGARSS)

■IGARSS in Seoul, Korea

IEEE Geoscience and Remote Sensing Symposium, 25-29 July 2005

– Harmony Between Man & Nature –

Thursday Afternoon (15:00 - 17:40), July 28

Room: COEX 330 B

135. Utilization of Satellite Imagery for Analysis of Vegetation in East Asia

Chair: Ken-ichiro Muramoto

Co-Chair: Kyu-Sung Lee

15:00 Analysis of Temporal Variability of MODIS Leaf Area Index (LAI) Product over Temperate Forest in Korea

Sun-Hwa Kim, Kyu-Sung Lee, Ji-Hoon Park, Choong-Shik Woo

15:20 Spectal Variation of Vegetative Areas in Leaf-off Season Observed by Hyperspectral Data

Kyu-Sung Lee, Sun-Hwa Kim, Jeong-Rim Ma, Min-Jung Kook, Jung-Il Shin, Yang-Dam Eo, Yong-Woong Lee

15:40 Identification of Dead Tree of Japanese Oak Wilt (JOW) using High Spatial resolution Satellite Imagery

Ryotaro Komura, Naoto Kamata, Mamoru Kubo, Ken-ichiro Muramoto

16:00 Mapping Forest Burned Area Using MODIS Data in China

Ronggao LIU, Jiyuan Liu, Xiaoliang LV, Dafang Zhuang, Hou Yan

16:20 Tree crown Detection and Classification using Forest Imagery by IKONOS

Mamoru Kubo, Ken-ichiro Muramoto

Analysis of Temporal Variability of MODIS Leaf Area Index (LAI) Product over Temperate Forest in Korea

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Abstract— MODIS LAI product is very important because it has potential for the monitoring of global scale ecosystem, global change of carbon and water. This study aims to analyze the temporal variability of annual MODIS LAI product using field measured LAI dataset for four vegetation types. The MODIS annual LAI pattern shows the high variety or inaccuracy of LAI during rainy season over South Korea. This phenomenon is caused by high cloud coverage and fails of processing by a radiative transfer model in this rainy season. Annual LAI pattern estimated by a radiative transfer model has least variance of LAI values during this time. In coniferous forest, MODIS annual LAI pattern shows the abnormal decreasing of LAI during nongrowing season comparing with field-measured LAI. This decrease of LAI being an inaccurate phenomenon is caused by rather higher cloud coverage and decreasing of understory plants.MODIS LAI product in deciduous and grass coverage is underestimated by comparing with field-measured LAI. In rice paddy, MODIS LAI shows longer growing season than field measured LAI. For the accurate analysis of temporal MODIS LAI product, it needs considering of vegetation coverage types, cloud coverage, and algorithm types of MODIS LAI.

Spectal Variation of Vegetative Areas in Leaf-off Season Observed by Hyperspectral Data

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Abstract—Due to the phenological variation of vegetation growth in temperate region, it is often difficult to accurately assess the surface conditions on agricultural croplands, grasslands, and disturbed forests by current multi-spectral remote sensor data. In particular, the spectral similarity between soil and dry vegetation has been primary concern to correctly appraise the surface conditions during the non-growing seasons in temperature region. This study analyzes the spectral characteristics of the mixture of dry vegetation and soil. The reflectance spectra were obtained from laboratory spectroradiometer measurement and from EO-1 Hyperion image data. The reflectance spectra of several samples having different level of dry vegetation fractions show similar pattern from both lab measurement and hyperspectral image. Shortwave IR wavelengths, in particular at wavelength near 2200nm, are more sensitive to the fraction of dry vegetation. The reflectance spectra of bare soil could be distinguished from the other surfaces covered by dry vegetation during the leaf-off season.

Identification of Dead Tree of Japanese Oak Wilt (JOW) using High Spatial Resolution Satellite Imagery

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Abstract-The incidence of Japanese oak wilt (JOW) has been increasing in Japan since late 1980s. The JOW is caused by the ambrosia fungus *Raffaelea quercivorus* vectored by an ambrosia beetle *Platypus quercivorus*. Detection of trees killed by JOW is important to prevent new incidence of JOW but difficult because most of JOW mortality occurs in mountainous area. Remote sensing with high spatial resolution imageries taken by IKONOS® or Quickbird® can be laborsaving technology to identify individual trees killed by JOW over wide areas. A purpose of this study is to develop a laborsaving image processing technique to identify individual tree crowns. The orthophoto imagery was transformed both to HSI (Hue, Saturation, and Intensity) and NDVI (Normalized Difference Vegetation Index) datasets. Individual dead tree crowns killed by JOW were identified by cluster analysis using datasets of H, S, and NDVI.

Mapping Forest Burned Area Using MODIS Data in China

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Abstract –The burned area is an important parameters for modelling the carbon cycles. The remote sensing tenology is a only way to monitor it at large scale region. In general, two temporal vegetation index difference was used to detect the burned area. But this technology is difficult to be applied to large-scale region owing to the BRDF effect, atmospheric contamination, geolocation errors, phenological changes, vegetation regrowth and others. In this paper, a new approach was proposed to detect the burned area using MODIS data, which is based on the vector-change technology, and combines the MODIS 500 and 250 meter resolution bands data to find 250 meter resolution burned area. The method adequately uses the spectral and multi-spatial resolution character of MODIS data that can resist the noise pollution and improve the detection accuracy. The detection results are very corresponding with the visual interpretation under different background. Since the method needs no prior knowledge, it could also be applied in large region scale. Based on this algorithm, the burned area dataset covering all China from 2000 to 2004 were produced.

Tree Crown Detection and Classification Using Forest Imagery by IKONOS

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Abstract—The purpose of this study is detection and classification of tree crowns using forest imagery taken by IKONOS. A forest image contains many tree crowns of different sizes and shape that are touching each other. By using IKONOS pan-sharpened data, discernment of tree crown and species is possible. To detect tree crowns in the image, we used watershed segmentation. If an image is viewed as a surface, with mountains and valleys, the watershed segmentation finds intensity valleys in an image. In this study, a gradient of intensity in an image was used in order to find valleys separating tree crowns from shadows. To classify tree species, the spatial features of each segmented region were calculated. Image features for the classification were extracted by texture analysis using gray level co-occurrence matrix. Image texture is produced by an aggregation of unit features, such as tree leaves and leaf shadows. Variations in crown texture are important in the identification of species. Supervised classification using maximum likelihood decision rules with these features was performed. Classification accuracies on the order 80% were achieved.