

Land cover classification based on the phenology of Korea using NOAA-AVHRR

Won-Joo Kim, Ki-Deock Nam, Chong-Hwa Park

Department of Landscape Architecture, Graduate School of Environmental Studies, Seoul National University
Seoul, 151-742, Korea

Tel.: 02-884-8547 FAX : 02-872-2106

wonjoo@snu.ac.kr, namk@hotmail.com, rsgis@snu.ac.kr

ABSTRACT

It is important to analyze the seasonal change profiles of land cover type in large scale for establishing preservation strategy and environmental monitoring. Because the NOAA-AVHRR data sets provide global data with high temporal resolution, it is suitable for the land cover classification of the large area. The objectives of this study were to classify land cover of Korea, to investigate the phenological profiles of land cover.

The NOAA-AVHRR data from Jan. 1998 to Dec. 1998 were received by Korea Ocean Research & Development Institute(KORDI) and were used for this study. The NDVI data were produced from this data. And monthly maximum value composite data were made for reducing cloud effect and temporal classification. And the data were classified using the method of supervised classification. To label the land cover classes, they were classified again using generalized vegetation map and Landsat-TM classified image. And the profiles of each class was analyzed according to each month.

Results of this study can be summarized as follows. First, it was verified that the use of vegetation map and TM classified map was available to obtain the temporal class labeling with NOAA-AVHRR. Second, phenological characteristics of plant communities of Korea using NOAA-AVHRR was identified. Third, NDVI of North Korea is lower on Summer than that of South Korea. And finally, Forest cover is higher than another cover types. Broadleaf forest is highest on may. Outline of covertype profiles was investigated.

Key Words : NOAA AVHRR, land cover classification, Phenology

1. Introduction

The Landcover type maps of regional scale have been produced by TM image etc. But this maps was only one day's cover. It is important to analyze the seasonal change profiles of land cover type in large scale for establishing preservation strategy and environmental monitoring. Because the NOAA-AVHRR data sets provide global data with high temporal resolution, it is suitable for the land cover classification of the large area. The objectives of this study were to classify land cover of Korea, to investigate the phenological profiles of land cover, and to investigate the relationships between land cover and natural environmental factors.

2. Data

The NOAA-AVHRR data from Jan. 1998 to Dec. 1998 were received by Korea Ocean Research & Development Institute(KORDI) and were used for this study. And TM image and forest vector map was used for analysis(Table 1). The software using analysis was Er-Mapper 6.0, Arcview 3.1 and ArcInfo 7.1.1.

<Table 1> GIS Database

Map	Item and Date of Data	Source
Base Map	Boundary, Province Road, Stream	DCW
Forest Map	Types, Ages, Density (Seoul, Kyongkido, Jejudo)	FRI
TM	1996. 9. 1 (Path 116-34), 1992. 5. 3 (Path 115-37)	
NOAA/AVHRR	1999.1 ~ 1999.12	KORDI

3. Methodology and Analysis

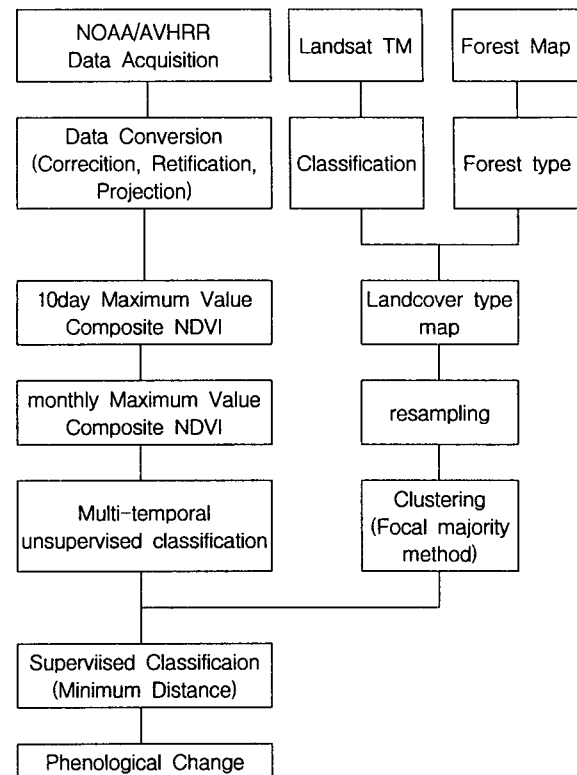
It was getting NOAA/AVHRR image data by Terrascan system. This data was transformed Er-mapper format(ers) The NDVI data were produced from this data. And monthly maximum value composite data were made for reducing cloud effect and temporal classification. NDVI PN was Scaling by method AVHRR Global Scaling as below :

$$\text{scaled} = (\text{actual} + \text{shift}) * \text{scale} + \text{offset}$$

$$\text{actual} = (\text{scaled} - \text{offset}) / \text{scale} - \text{shift}$$

$$(\text{shift} : 1, \text{scale} : 100, \text{offset} : 10)$$

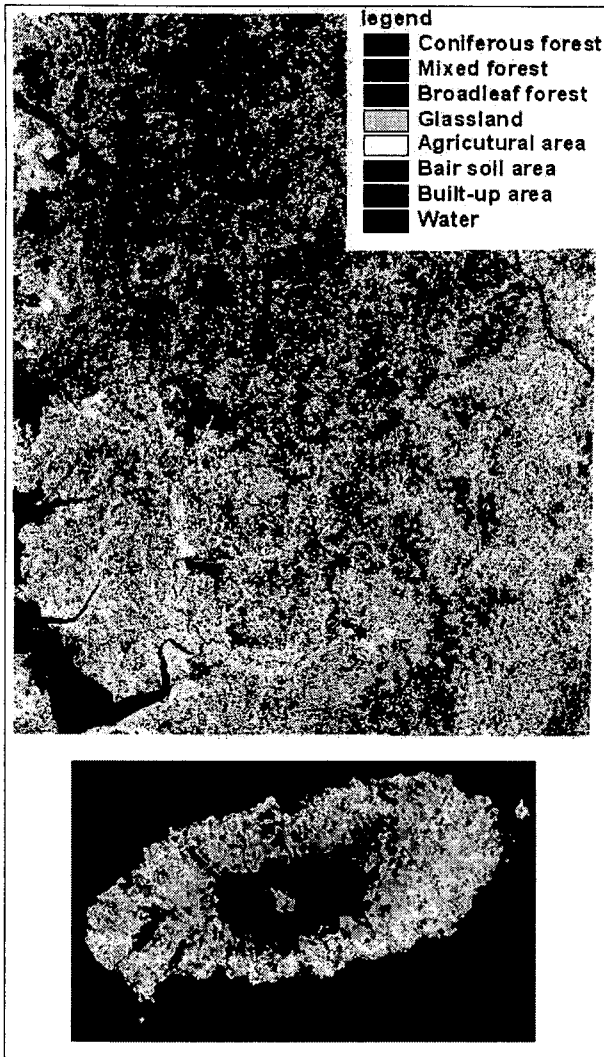
This NDVI daily data were rectified using the vector map which have shore line and islands. GCP was 130 numbers and average RMS error was 0.67.



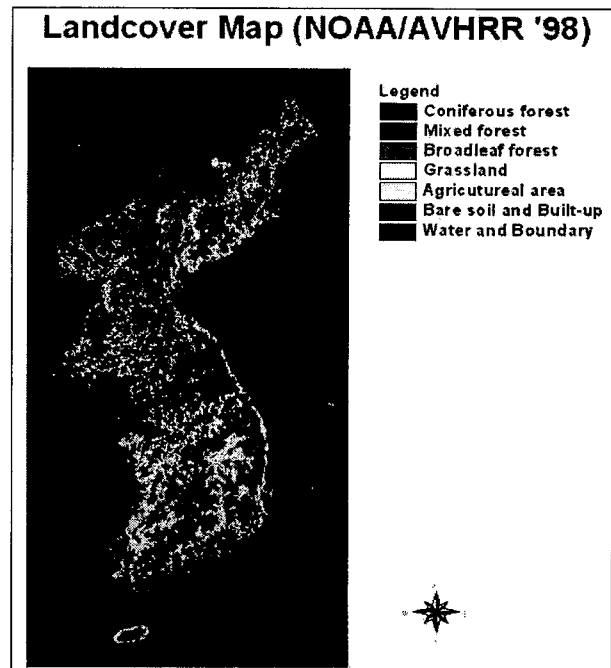
<Fig. 2> Flow chart of the research

Landsat TM images of Kyongkido and Jejudo was classified using the method of unsupervised classification and post classification by field data. Also Forest map was combined with this classification landcover map. Therefore class category was 8 class : coniferous forest, mixed forest, broadleaf forest, grassland, agricultural area, bare soil, built-up area, water.

This map for training site was resampled as 1 km resolution which is equal to NOAA/AVHRR data. and each lass was allocated by focal majority method. this method is for each cell location on an input grid, finds the majority value within a specified neighborhood and sends it to the corresponding cell location on the output grid. After that, monthly NDVI was classified using the method of supervised classification (Minimum Distance). And the profiles of each classified class was according to each month.



<Fig. 1> Landcover map which was produced using TM and Forest map



<Fig. 2> NOAA '98 Classification Map of Korea

And the NDVI of North Korea is higher on Summer than that of South Korea<Fig. 3>. Because North Korea has broader forest than South Korea. And Forest cover is higher than another cover types<Fig. 4>. Broadleaf forest is highest on may<Fig. 5>.

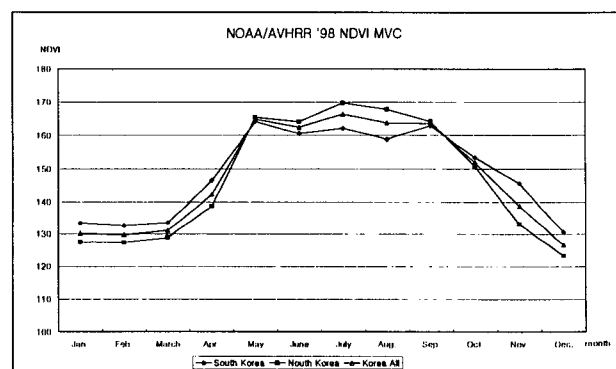
In further study, this classification map will be verified. and classification map And the profiles of each class will be compared with natural environmental factors, such as latitude, altitude and monthly temperature.

4. Result and Discussion

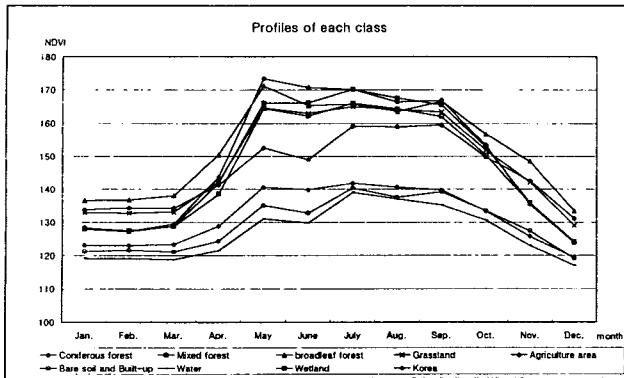
In this study, TM classified map was used for training site of NOAA data. Although the difference of resolution is being between TM and NOAA, it was useful when it was allocated using resampling and focal majority method.

This study result shows the landcover map<Fig. 2>. The shore provinces of North Korea is many bare soil area. The land of North Korea was badly clothed because of drought and flood through many years. this map presents the situation.

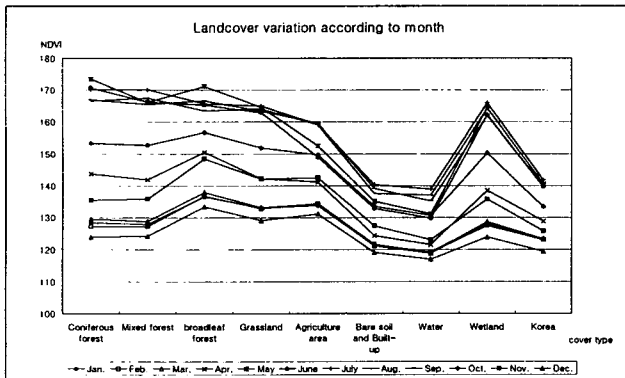
The mountain of North Korea have mixed forest type than that of South Korea. The phenological characteristics of plant communities of Korea using NOAA-AVHRR was identified.



<Fig. 3> NOAA/AVHRR '98 NDVI MVC



<Fig. 4> Profiles of each class



<Fig. 5> Landcover variation according to month

5. Conclusion

This study was investigated about outline of landcover profiles of Korea. And The merit of temporal classification of NOAA/AVHRR was identified in this study.

6. Acknowledgments

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