

ANALYSIS OF TEMPERATURES DISTRIBUTION OF FOREST TYPE CLASS USING LANDSAT IMAGERY

Joon-Mook Kang*, Hee-Cheon Yun*, Joon-Kyu Park**

*Department of Civil Engineering, College of Engineering, Chungnam National University 220, Gung-dong, Yuseong-gu, Daejeon, Korea

**Civil Engineering, Division of Engineering, Seoul University Seoidaehak-gil-22, Jungnang-gu, Seoul, Korea

INTRODUCTION

In this study, temperature distribution about the each forest type was analyzed using thermal infrared band and digital forest type map. Surface temperature about study site was calculated using satellite imagery, and it was able to extract temperature about each forest types (age class, diameter class, species of trees) effectively using digital forest type map. The results of this study are expected to be utilized basic data about urban planning and creating recreation space inside the forest.

DATA ACQUISITION

Gongju in South Chungchong Province, Korea overgrown with a forest around was chosen the study area to calculate temperature each species of tree, age and thickness of the forest using Landsat satellite imagery and was calculated surface temperature using imagery in April 2003, October 2006 and June 2009 and the digital forest cover type map.

Satellite imageries used in this study

Sensor	Landsat ETM+	Landsat TM	Landsat TM
Date	2003/04	2006/10	2009/06
Spec.	30m	30m	30m
	Multi-Spectral	Multi-Spectral	Multi-Spectral



2003/04



2006/10



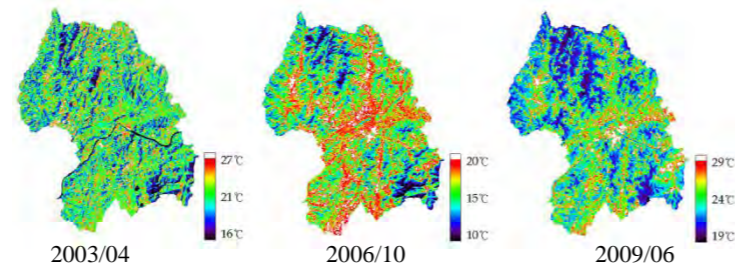
2009/06



Digital forest type map

DATA PROCESSING

- Based on NASA model, the periodic temperature is calculated from equation for surface temperature calculation.



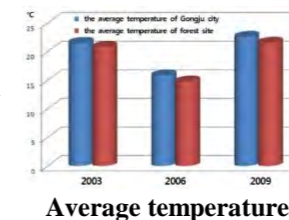
Surface temperature about study site

- Mask bands about age class, diameter class, and species of trees were produced by using the digital forest type map of Gongju and three season imageries were masked.
- Pure forest land area by forest type about the study site is 605.67km², it is about 64.35% in the whole area of the city.

Diameter Class		Age Class		Species of Trees			
Class	Area(%)	Class	Area(%)	Class	Area(%)		
Xsmall (diameter <6cm)	11.67km ² (1.93%)	1 (age 1~10years)	8.22km ² (1.35%)	Conifer	257.75km ² (51.90%)		
		2 (age 11~20years)	43.26km ² (7.10%)				
Small (diameter 6~16cm)	40.06km ² (6.61%)	3 (age 21~30years)	345.60km ² (56.76%)				
		4 (age 31~40years)	196.52km ² (32.28%)				
Middle (diameter 18~28cm)	537.06km ² (88.67%)	5 (age 41~50years)	13.08km ² (2.15%)			Deciduous	238.89km ² (48.10%)
		6 (age 51years)	2.17km ² (0.36%)				
Large (diameter >30cm)	16.87km ² (2.79%)						

RESULT AND ANALYSIS

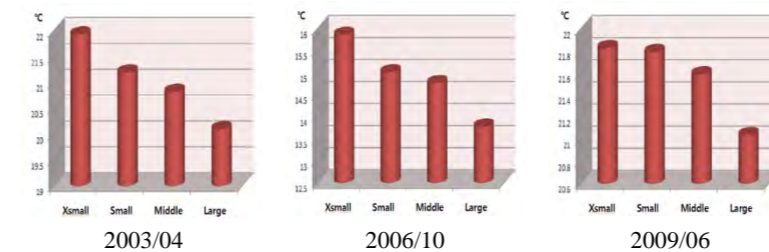
- In this study, masking is carried out about each of the forest type class to figure out temperature distribution of the forest type class, and the temperature is calculated about the results.
- When temperature of the study site is compared with the whole city, all of the mean temperature of the study site in 2003, 2006, 2009 are about 1°C lower than the mean temperature of near Gongju.



Average temperatures

- Temperature Distribution of Diameter Class

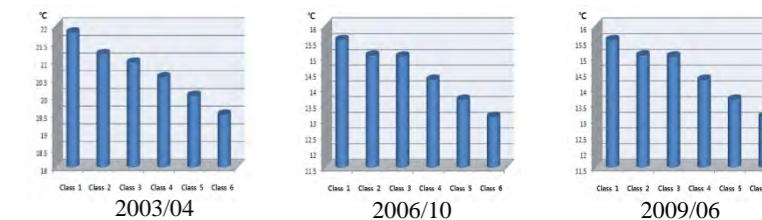
Diameter Class	2003/04	2006/10	2009/06
Xsmall	21.93°C	15.86°C	21.83°C
Small	21.20°C	15.01°C	21.79°C
Middle	20.82°C	14.77°C	21.59°C
Large	20.10°C	13.78°C	21.04°C



Temperature by diameter class

- Temperature Distribution of Age Class

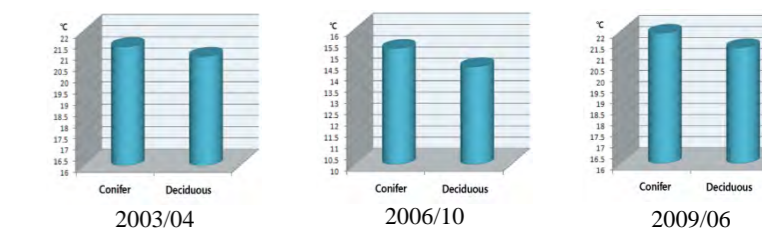
Age Class	2003/04	2006/10	2009/06
Class 1	21.82°C	15.56°C	21.90°C
Class 2	21.21°C	15.07°C	21.81°C
Class 3	20.97°C	15.04°C	21.79°C
Class 4	20.56°C	14.30°C	21.22°C
Class 5	20.03°C	13.66°C	21.02°C
Class 6	19.50°C	13.12°C	21.00°C



Temperature by age class

- Temperature Distribution of Species of Trees

Species of Trees	2003/04	2006/10	2009/06
Conifer	21.29°C	15.14°C	21.91°C
Deciduous	20.85°C	14.33°C	21.25°C



Temperature by species of trees

CONCLUSIONS

In this study, the followings are conclusions by analysis of temperature according to the forest type of the area using multi-temporal satellite imageries and digital forest type map.

- First, forest area has low temperature about 1°C than the other study areas. Based on this finding, it is concluded that forest area influences temperature decreases.
- Second, forest area with large diameter and high age showed lower temperature than any other areas. And deciduous area shows slightly lower temperature than conifer area.
- Third, it is expected that information provided by satellite imagery and digital forest type map will be convenient and useful to urban planning and afforestation.

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**2003/04
Landsat ETM+**



**2006/10
Landsat TM**



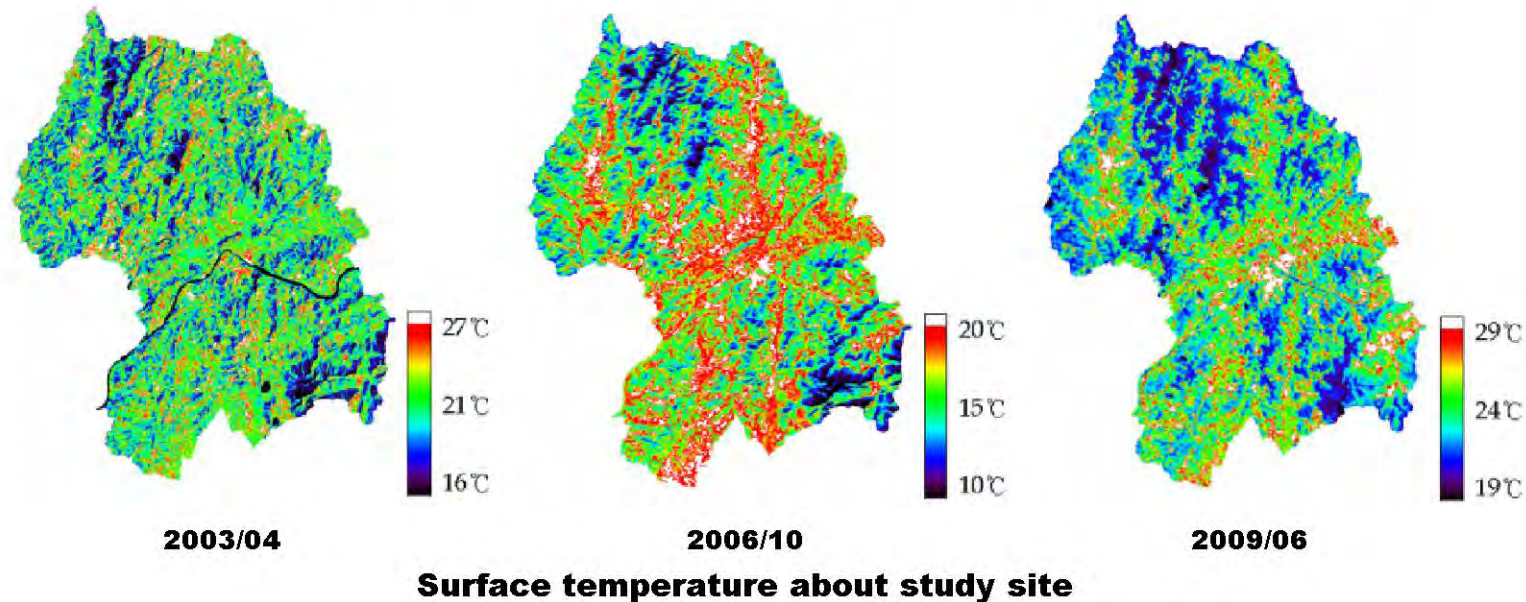
**2009/06
Landsat TM**



Digital forest type map

DATA PROCESSING

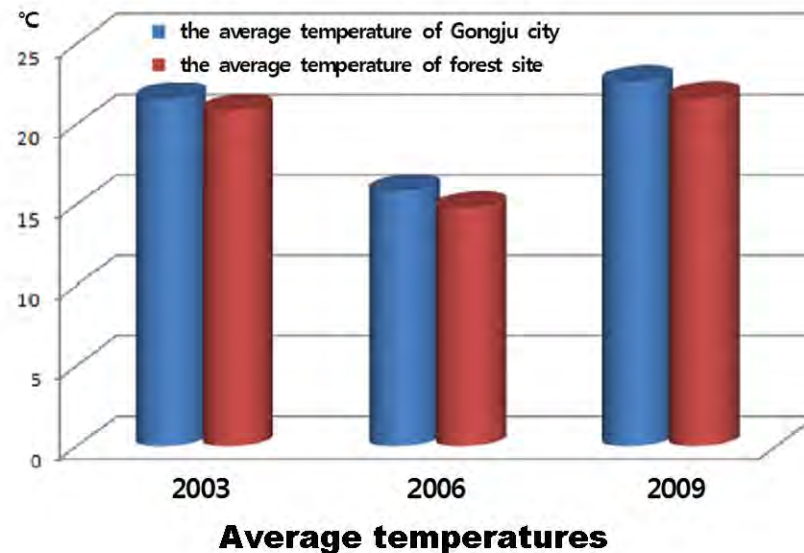
- Based on NASA model, this study calibrates surface temperature from the DN which represents the absolute radiation of land cover.



- Satellite image processing program was used to extract the surface temperature and then digital forest type map was used to calculate the surface temperature about the type of each forest type (age class, diameter class, and species of trees).

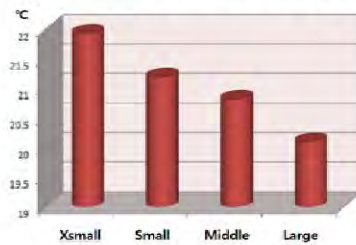
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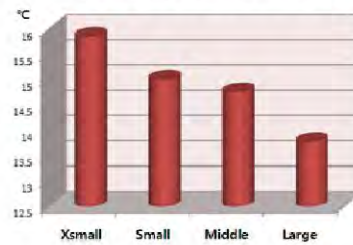


RESULT AND ANALYSIS

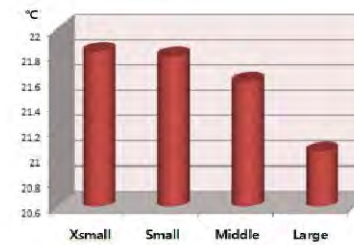
Temperature Distribution of Diameter Class



2003/04

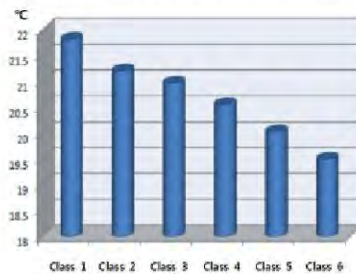


2006/10

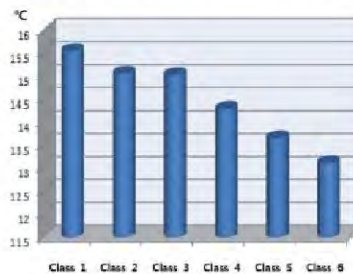


2009/06

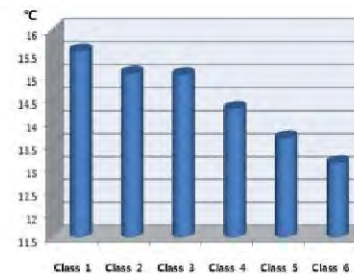
Temperature Distribution of Diameter Class



2003/04

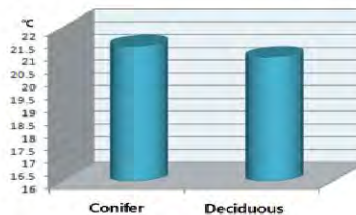


2006/10



2009/06

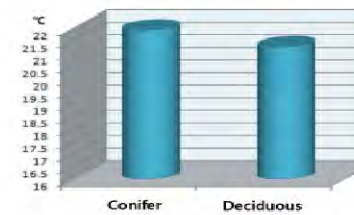
Temperature Distribution of Species of Trees



2003/04



2006/10



2009/06

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