The reserch evaluation of shadow influence in NOAA AVHRR data

Kim Dong Hee* Tateishi Ryutaro**, Choi Seung Pil***

Abstract : Vegetation shows unique spectrum characteristics compared with other materials. If such characteristics are used, land change pattern can be determined. Thus, vegetation has an absorption belt and a reflective belt in visible and near infrared, and reflectance is very high.

Then, various methods of monitoring vegetation paying attention to the absorption wavelength region and reflective region of vegetation are proposed. However, there are various problems in grasping change of vegetation by NDVI, PVI, etc. It is very difficult especially to remove various noise ingredients in the received satellite data. Until now, it is difficult to compensate for shadow effect when NDVI is used in vegetation analysis.

The results is, if the shadow is about 60% the pixel will be wrongly classified as may be vegetation or not.

1. Introduction

Various environmental problems in the earth are generated in many cases by human's social activity. In order to reduce the damage by such environmental problem, it is necessary to respond by predicting the change pattern of a natural phenomenon early more. Then, in order to grasp change of such land use, the land covering classification using the artificial satellite data which can observe a wide range area periodically is studied actively. Since vegetation shows the unique spectrum characteristic compared with other substances, if such the characteristic is used, it can presume the change pattern of land. For example, generally, although photosynthesis coloring matter absorbs an electromagnetic wave well in the wavelength belt of 300 to 500 nm, especially chlorophyll shows a high absorbs in the red wavelength (600 to 700 nm) which other coloring matter seldom absorbs. On the other hand, vegetation shows high reflectance in near infrared (800-1300nm). Thus, vegetation has an absorption belt and a reflective belt in visible and near red infrared, and reflectance is very large. Then, various methods of performing the monitoring of vegetation paying attention to the absorption wavelength

* Chiba University Ph.D course of CEReS(E-mail:kdonghee0616@hotmail.com)
** Chiba University Professior of CEReS(E-mail":tateishi@faculty.chiba-u.jp)
*** Kwandong University Professior of Civil Engineering(E-mail:spchoi@kwandong.ac.kr)

region and reflective region of vegetation are proposed. However, there are various problems in grasping change of vegetation by NDVI, PVI, etc. It is very difficult especially to remove various noise ingredients in the received satellite data.

In NDVI used for analyzing change of vegetation especially until now, the compensation about the vegetation influence of such a shadow was difficult.

Then, necessity of the study of influences of shadow in NOAA (National Oceanic and Atmospheric Administration) AVHRR data (Advanced Very High Resolution Radiometer).

2. Analysis of spectral reflectance

2.1 GTD data

In order to investigate the in influence of shadow on vegetation reflectance, contributions of cloud shadows is analyzed. The spectrum of dryness ground is also influenced by shadows. These influences were measured using the reflective meter.

Figure 1 shows the result of GTD(Ground Truth Data) survey.

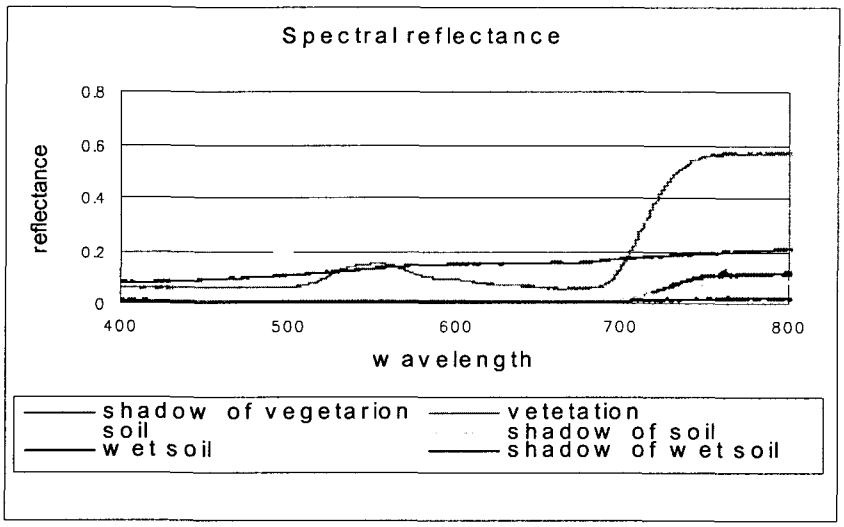

Figure1. Spectral reflectance of GTD(Ground truth data)

2.2 Application using NOAA AVHRR data

In Chiba University, the data which will include Japan, and a part of South Korean, a part of China from 1998 is received.

This research, the influence of the shadow by clouds. It analysis the whole of Japane. In Japan, there is especially much influence of the shadow by the typhoon etc. from June to August. For example, figure3 shows the August 1-10 10day composite for 1998 of sampling point near Gifu Prefecture shows that there is a shadow by clouds looking at it.

The thickness of clouds is deep when the color is thick. RGB is ch1, ch2 and NDVI of NOAA AVHRR, respectively. The following Figure 3 shows the NDVI Composite picture.

Figure3 shows the one sample point 1 is not influenced by shadow, sample point 2 which is influenced by shadow chosen.

Figure 4 shows the land-cover map of Japan used for selecting points.

It is thought that the point which has the influence of a shadow according to Figure 5 has the highest NDVI value.

However, by the actual image sample point2, it has the influence of a shadow and it is thought that the shadow influence correctedby 60% is or more.

The result shows the figure 7.

In Channel 1 as the shadow increases from to about 60% the spectral reflectance decreases from 0.05 to 0.01. In channel 2 the spectral reflectance decreases from 0.5 to 0.15. However, as its shadow increase in the NDVI also increase.

Figure 3. 1998 8/1-10 10 day composite

Figure 4. Land-cover map of Japan

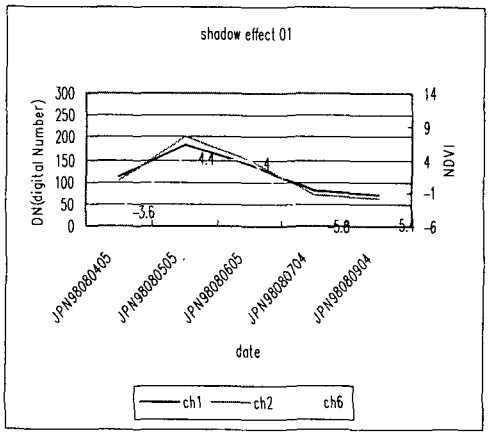

Figure 5. Shadow effect of sample point

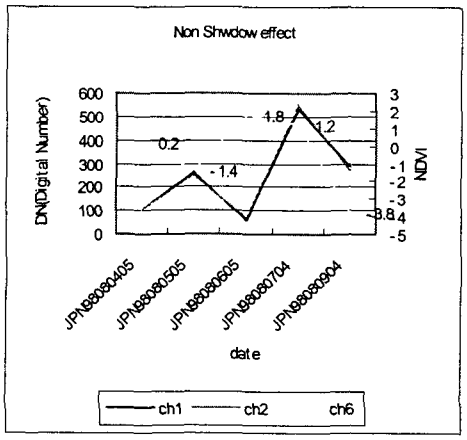

Figure 6. Non shadow effect of sample point

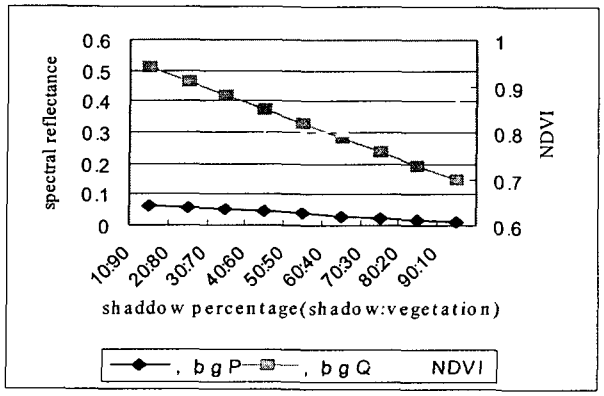

Figure 7. Vegetation and correlation of a shadow

Figure 8. shows stde value for the sample point

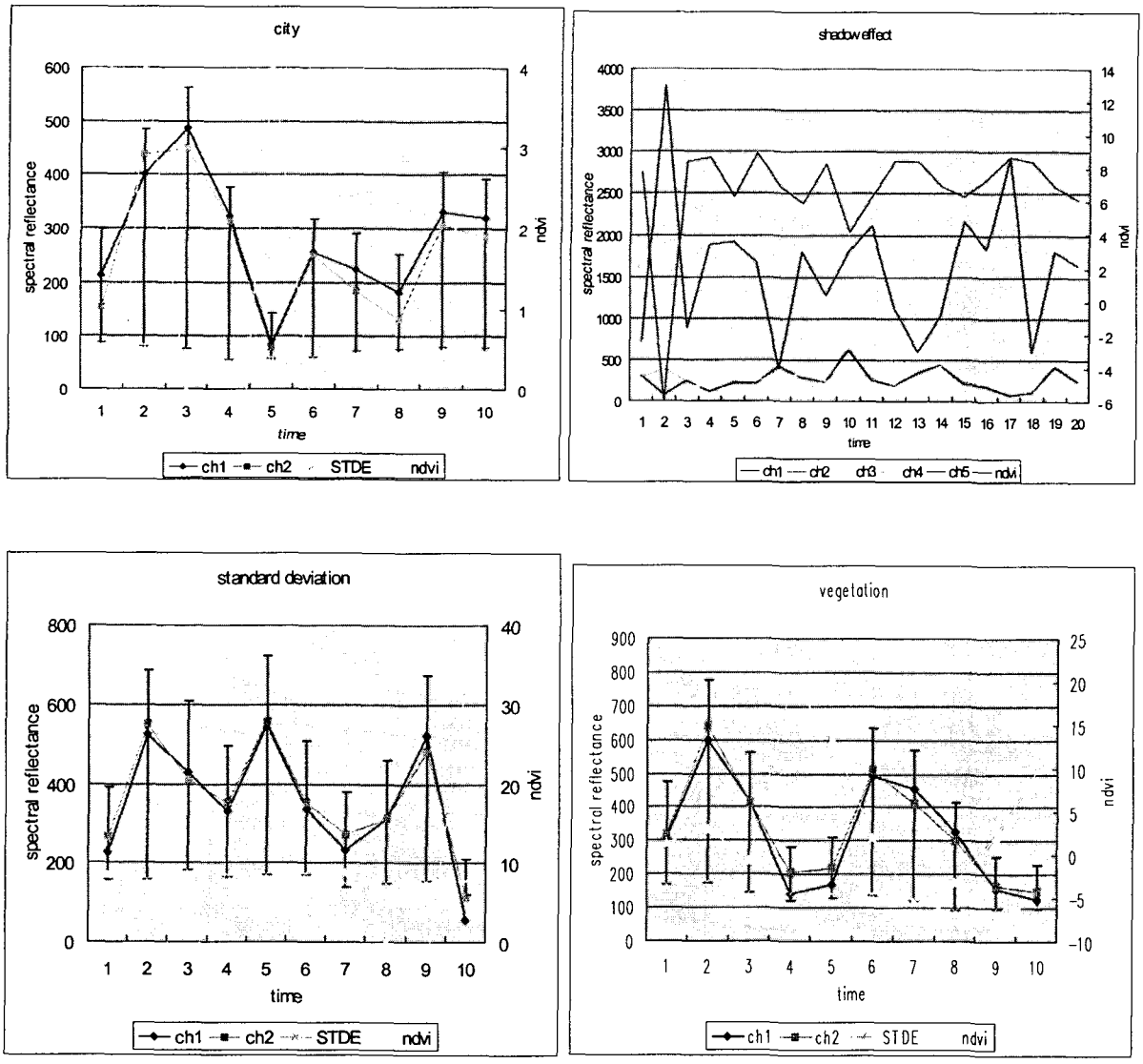

Figure 8. Stde graph of sample point

For the 10 day composite the maximumNDVI was chosen. This maximum NDVI was not correct due to shadow effect.

Figure 9 shows the change for one year. NDVI took the high value and its low value for corresponding minimum values of channel 1 and 2.

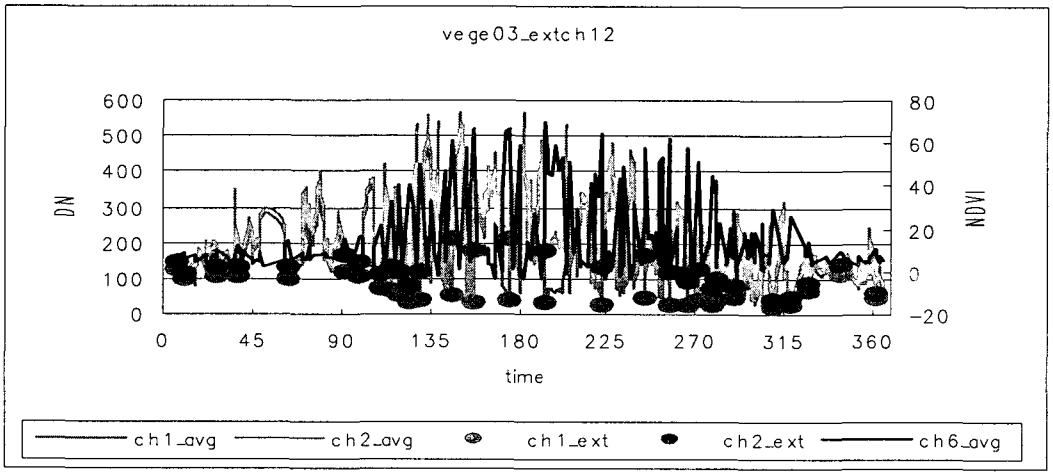

Figure 9. Change for one year of the sample point

Figure 9,10. Shows the shadow effect point

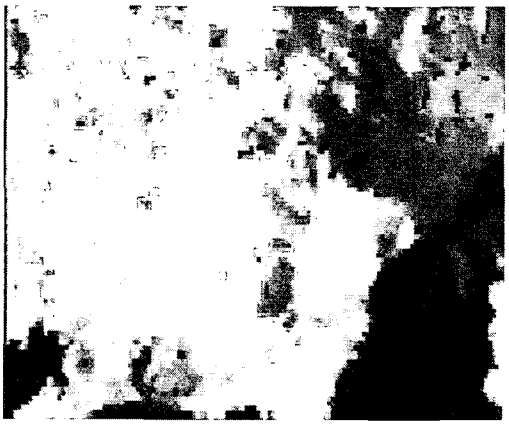

Figure 10. 1998. 08.05

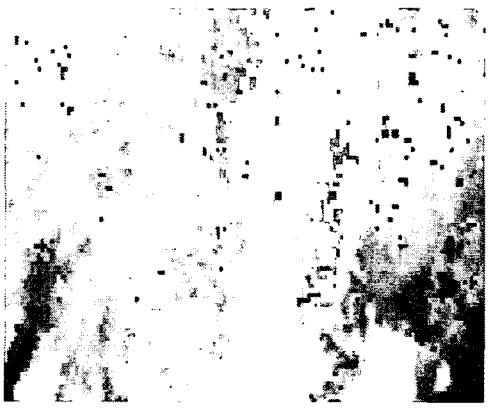

Figure 11. 1998.08.01-10 composite data

3. Conclusion

Although the influence on the NOAA data due to shadow effects was investigated in this research covering change, have conventionally the possibility of carrying out the composite of the data with which the influence of a shadow remains as it is.

It is illustrated that within a pixel, if the shadow is about 60% the pixel will be wrongly classified as may be vegetation or not.

In order to solve the problem, it is suggested that before MVC is chosen analysis for the detection of influence of shadows should be carried out any other methods.

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