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The reserch evaluation of shadow influence in NOAA AVHRR data
NOAA AVHRR 자료에서 구름으로 인한 그림자 영향에 관한 조사

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Abstract

광범위한 면적의 토지피복분류를 관찰하는데 유용하게 사용되고 있는 NOAA AVHRR 자료는 자료의 방대한 양과 구름에 의한 영향을 없애기 위하여 일반적으로 MVC(Maximum Value Composite) 처리를 하여 사용한다.

그러나 수신당시의 여러 가지 환경인자(구름, 저주파 노이즈, 산란, 구름의 그림자 등)에 의하여 각 채널의 패턴이 변화하여 오독을 할 위험성이 있다.

특히 그림자의 영향에 의해 측정치가 변화하는 NOAA 위성의 채널2영역에서는 이러한 특징이 두드러진다.

따라서 본 연구에서는 지상에서 실제로 측정한 자료를 기초로 하여 NOAA 영상자료에서 구름으로 인한 그림자의 영향에 관하여 조사하였고, 한 픽셀안에서 그림자의 영향이 60%이상이 될 경우에는 오독의 가능성이 높은 것으로 나타났다.

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 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.

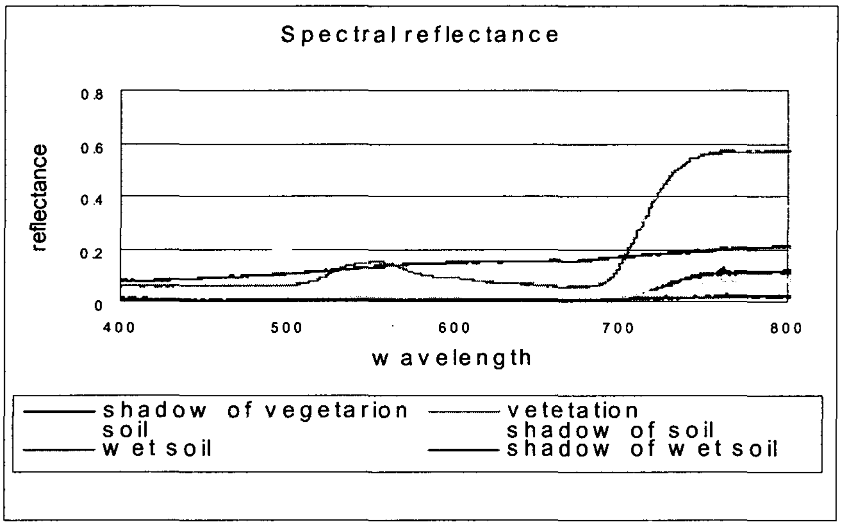

Figure1. Spectral reflectance of GTD(Ground truth data)

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.

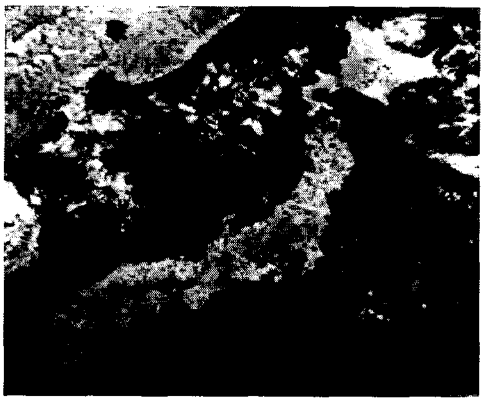

Figure 3. 1998 8/1−10 10 day composite

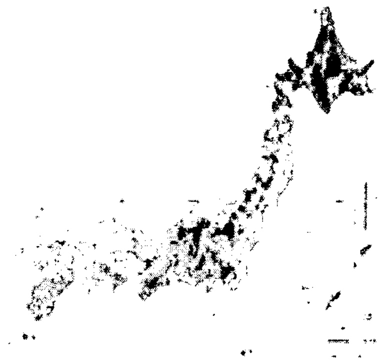

Figure4. Land−cover map of Japan

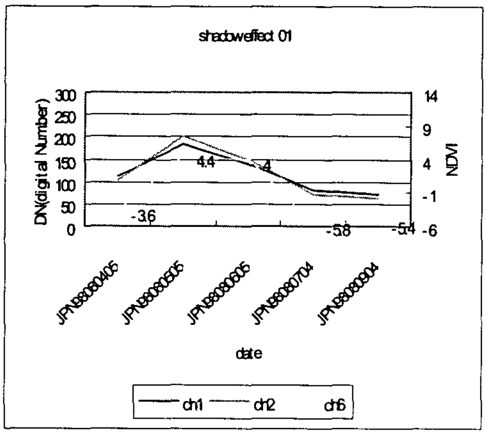

Figure5. Shadow effect of sample point

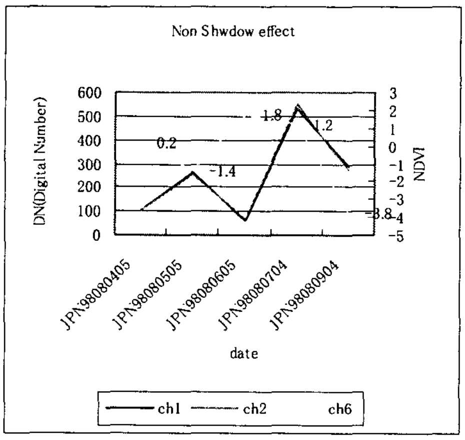

Figure6. Non shadow effect of sample point

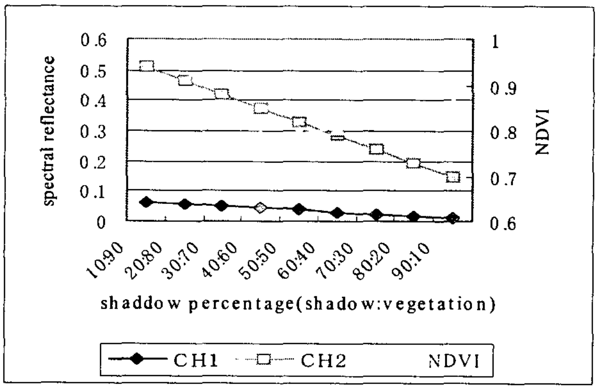

Figure7. Vegetation and correlation of a shadow

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

Figure 8 shows the change for one year. NDVI took the high value and its low value for corresponding minimum values of channel 1 and 2.

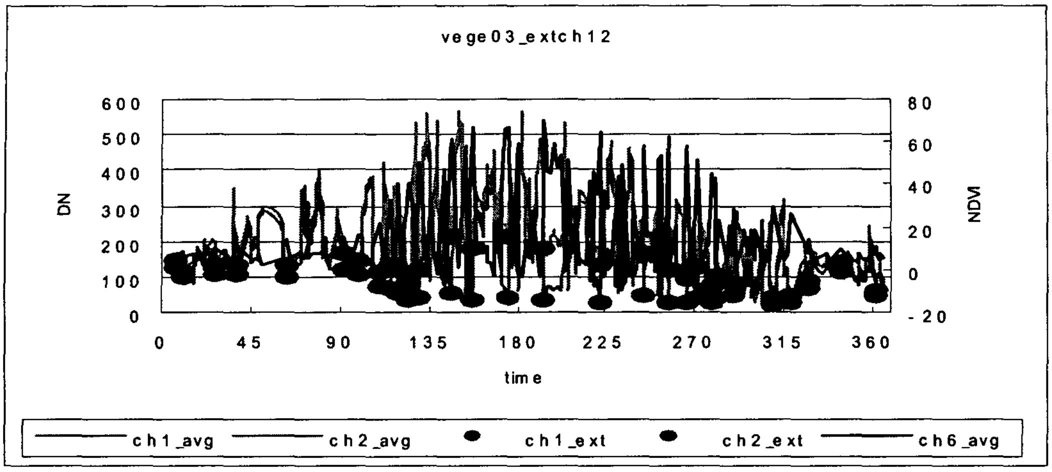

Figure 8. Change for one year of the sample point

Figure 9,10 Shows the shadow effect point

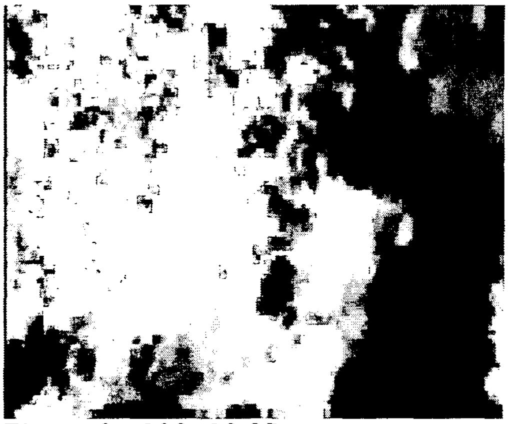

Figure 9 1998. 08.05

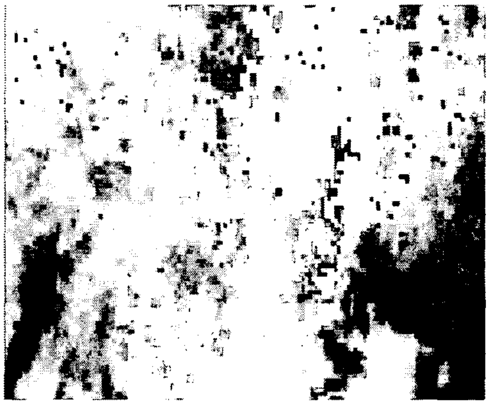

Figure10 1998.08.01−10 composite data

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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