Research on the extraction accuracy improvement of mangrove forests

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ABSTRACT: The objective of this study is to improve of the extraction accuracy of mangrove area, Southeast Asia. Global warming and sea-level rise are projected to affect seriously on low-land area. Recently, the mangrove forest is important to decrease the damage which is received from storm surge and sea-level rise. Therefore, it was proposed that the extraction method of mangrove area which is combined rationing method and re-extraction method based on the growth characteristic of mangrove. However, it was a problem that the low accuracy is caused in the area where the characteristic of land cover was similar to the tidal zone. Then, in this study, we proposed the method of correcting the distribution area by analyzing the geographic information for the tidal area.

1. Introduction

The average altitude of the lowland area located in the Asia is several meters (SRTM, GDEM etc.). For this reason, it is important to identify the geographic characteristics of land vulnerable to the influence of sea-level rise from global warming, or hurricanes. Our research group focused on the lowland area in Asia especially Vietnam, Thailand, and Myanmar. The 4th IPCC report found that the beach erosion accompanying sea-level rise is marked in low-lying countries. Then, we focused on the adaptation method using mangrove forest. Since a mangrove inhabits an intertidal zone, it is used not only in a lowland area but in the island country for coastal protection. So, in this research, we aimed to evaluate the distribution area of mangrove by using satellite data for the vulnerability assessment of coastal region.

2. Data and Methodology

2.1 Satellite data and DEM

The data used in this research are shown in Table 1. In order to extract a mangrove area, short wavelength infrared data is effective. For this reason, in this research, we decided to use EOS-Terra/ASTER. And, since atmospheric correction was performed, 2B05 products were selected. ETOP2 data was used in order to analyze the geographical feature of an intertidal zone. However, the resolution of ETOPO2 is insufficient in order to search for the submarine slope of Mekong Delta. In such area, we deciphered the chart directly.

2.2 Methodology

Fig. 2 shows the mangrove region extraction procedure in this research. First, band to band operation is performed using near-infrared data and short wavelength infrared data. Next, water area is removed using near-infrared data. By these steps, an intertidal zone and the land area data were extracted. Finally, mangrove area was classified based on the distribution conditions (vegetation, soil, water) and topographic feature.

Fig. 3 shows the extraction result of Mangrove area in Mekong delta. And, Fig. 4 and Fig. 5 were

local Mangrove area in Fig. 3 (Area (1) and Area (2)). In local area image, red color (left image) shows the Mangrove area. The image shown in right-hand side is a high resolution image. It was found that the accuracy of mangrove area division is good by using the short wavelength infrared.

Table 1 Satellite data and DEM

Data name	Resolution(m)	Observation date
EOS-Terra	15(VNIR)	2002/2/13
ASTER	30(SW)	2002/10/11
		2004/12/12
DEM	2-5(km)	ETOPO

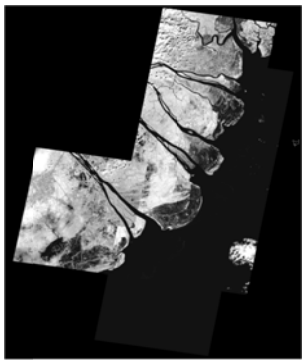

Figure 1 Satellite image (Mekong)

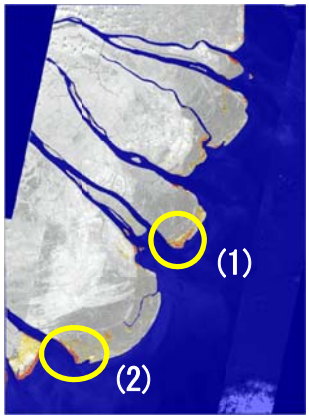

Figure 3 Mangrove area
(Red: Mangrove, Blue: water)

Area (1) High Resolution

Figure 4 Extraction areas (1)

Area (2) High Resolution

Figure 5 Extraction areas (2)

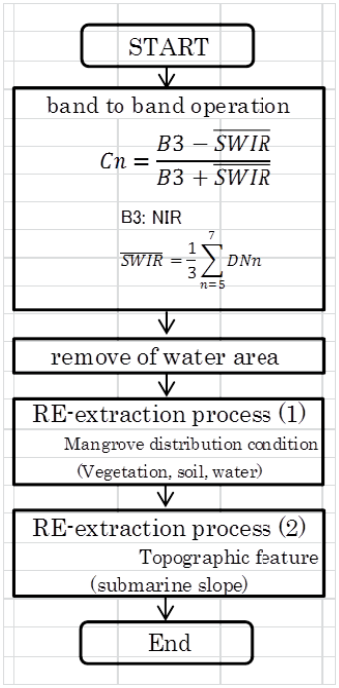

Figure 2 Extraction procedure

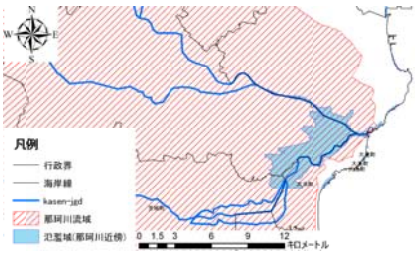

Figure 6 Flood Simulation Result

3. Conclusions and Future Works

3.1 Conclusions

The results of this study were as follows;

(1) It was found that the good accuracy was acquired by using the classification procedure using short wavelength infrared data.

(2) It was already proposed that the divisional procedure by using short wavelength infrared data and geographical feature conditions (Tamura 2012). Then, we proposed the method of correcting the

distribution area by analyzing the distribution conditions (vegetation, soil, water) and topographic feature for the tidal area.

3.2 Future Works

Figure 6 shows the flood simulation results of nakagawa-river at ibaraki prefecture, Japan. This simulation is the result of using only geographical feature data and tide level data. It is our future work to analyze how much a mangrove area contributes to reduction of a flood region.

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