DETECTION OF FILLED RICE PADDY FIELDS IN SOUTHEAST ASIA

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Abstract: Understanding the area of the rice paddy fields is important, and suitable for it the remote sensing. SAR is effective to the monitor in Southeast Asia with the rainy season. The detection of the filled rice paddy fields by RADARSAT was tried in the north part of Bangkok Thailand, and in the Mekong river valley Cambodia, which ware the main rice production country in Southeast Asia. We get observation data by RADARSAT and fields all through a year around Bangkok. However, because the flood had occurred on the study area in 2002 observed, the detection only of the rice fields ware difficult.
Keywords: SAR, rice, water, specula reflection

1 Introduction

Rice is a staple crop in Southeast Asia, and the grasp of the production is an important problem. Moreover, from viewpoint "Use and demand for water" to important problem, because rice farming need for a large amount of water. Therefore, understanding the area of the rice field is important, and suitable for it the remote sensing. All-weather type sensor like a SAR is effective to the monitor in Southeast Asia with the rainy season.

The detection of the filled rice paddy fields by RADARSAT was tried in the north part of Bangkok in Thailand, and in the Mekong river valley Cambodia, which ware the main rice production country in Southeast Asia.

2 Study area and data used

Study area is north part of Bangkok Thailand, and the Mekong river valley Cambodia. Data used ware RADARSAT Fine mode, and observation days show follow

Bangkok: 2002/05/24, 2002/06/17
2002/07/11, 2002/11/08
Cambodia: 2003/07/29

3 Method

SAR is active remote sensing sensor using microwave, and RADARSAT has Gband (5.3GHz, 5.6cm wavelength) SAR. The paddy fields are filled with water during rice-planting period. Almost microwave reflects at water surfaces like mirror, called 'specula reflection'. This phenomenon makes backscatter of SAR small value at the water-covered place, backscatter of the rice paddy can be distinguished as water surface at rice transplanting period. Then low backscatter area extract by threshold and filled rice paddy fields determine that extracted low backscatter area subset water area, which is river, pond etc. However, we could not get GIS data for subset water area both countries. In the feature, we get water area map or make it using multi temporal data.

4 Results

Case of Bangkok

Fig. 1 shows result of Bangkok. We consider that we can make mask of water area easily, and can determine the area of the rice paddy fields, because we have multi temporal RADARSAT data in Bangkok. However, in 2002, at Bangkok Thailand, it was abnormal weather and occurred flooding hardly. Fig. 2 shows RADARSAT image usually and flooding. Therefore we could not detect and determine paddy fields.

Case of Cambodia

Fig. 3 shows result of Mekong river valley Cambodia. It is easy to detect paddy under side of river in Fig. 3, but detection is difficult upper side of river. We requested more one scene RADARSAT, then will detect more accurate. However, in Cambodia, the reason of rice paddy fields detection difficultly is that size of rice paddy fields is very small, and the irrigation rainwater is made like the reticulation. In this study, we use fine mode RADARSAT data, but it is need more high resolution data for use detection small rice paddy fields such as Cambodia.

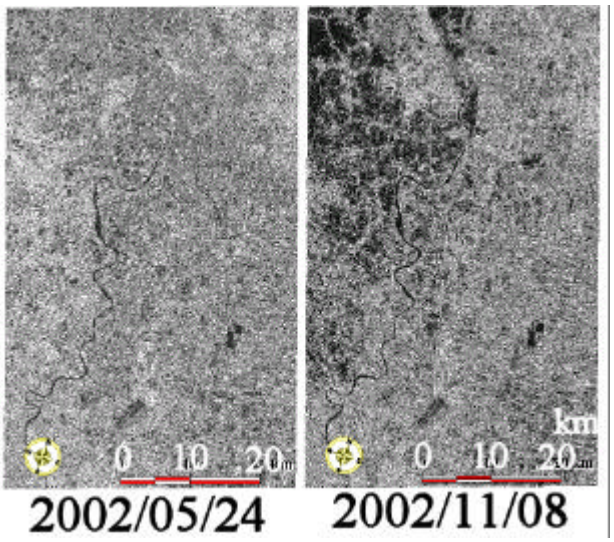

Fig. 2 Flooding north part of Bangkok in2002

5 Discussion

In Japan, Almost rice transplanting and harvesting is once in a year, in the word, 1 cycle per year. Moreover in east part of Japan transplanting is done same period; about 3 weeks. Fig. 4 shows one of case that the change of backscatter (beta0) urban, water, and paddy using RADARSAT in Japan[1]. The backscatter of

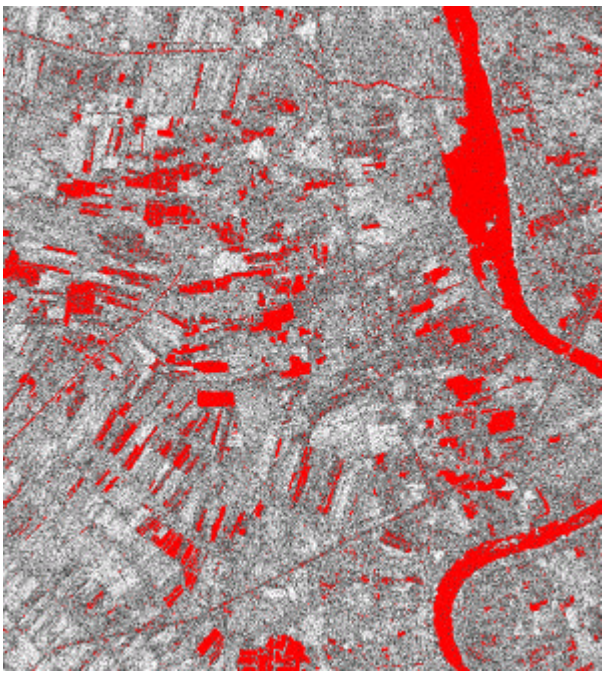

Fig. 1 Filled water detection in Bangkok

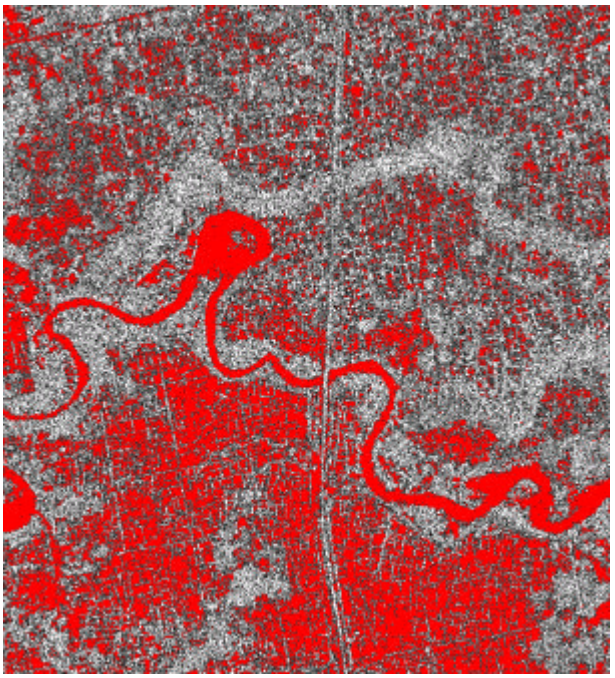

Fig. 3 Filled water detection in Cambodia

paddy fields is saturate about 1 month half. Therefore, when use RADARSAT, the area of the rice paddy fields can determine one or two times observation. Region that has more long period for transplanting, about 2 months, need more time observation.

Rice product is two or three cycles per year in South East Asia, and rice paddy status is contamination such as transplanting, growing, and harvesting etc. Fig. 5 shows one of the contamination case. Therefore it is difficult to determine the area of the rice paddy fields using a few SAR data. It is need multi temporal remote sensing data to determine the area of rice paddy fields. If rice product all through year, and monitoring using RADARSAT data, at least about 10 scene need for determine the area of rice paddy fields, because rice paddy fields backscatter reach saturate one month half. Another method is combination of high frequency optical Satellite data such as MODIS. However, it is need caution because rice paddy fields in Southeast Asia are small like a case of Cambodia.

6 Conclusion

In this study, we tried to detect filled rice paddy fields using RADRSAT in north part of Bangkok and Mekong river valley Cambodia. SAR expects to use monitoring for rice, because SAR can observe earth surface without influence of clouds. However, it is difficult to determine the area of the rice paddy fields using same method for Japan, because Southeast Asia's rice product is two or three cycles per year, and

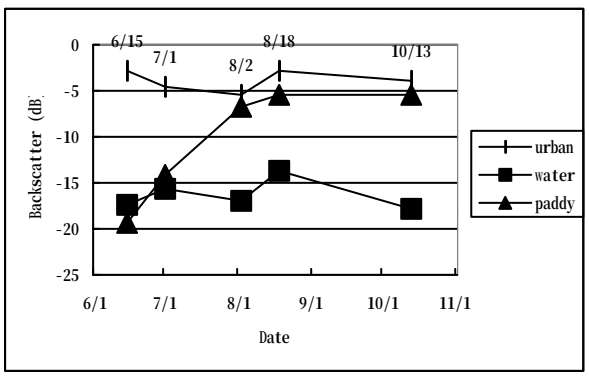

Fig. 4 Profile of backscatter change

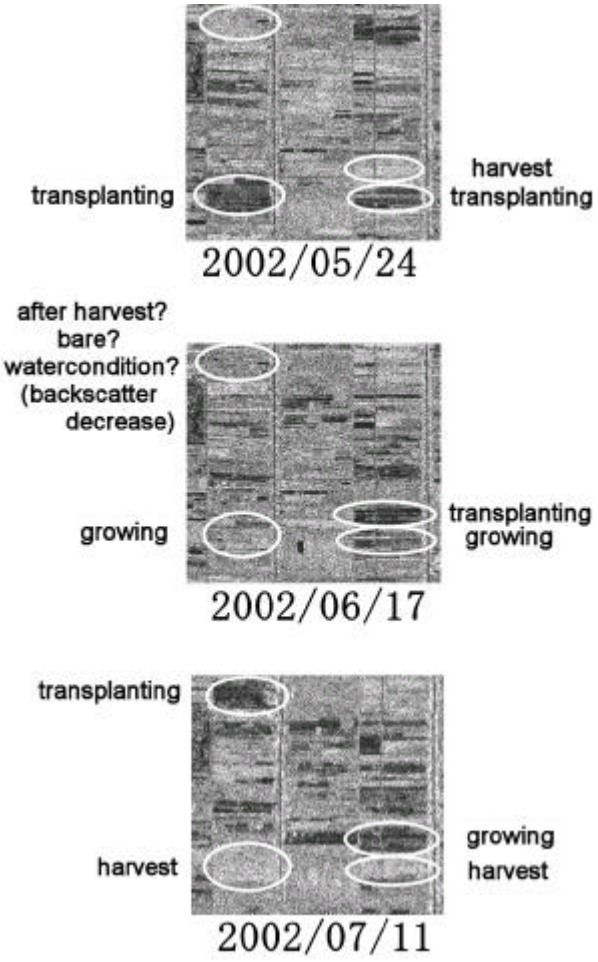

Fig. 5 case of contamination rice paddy fields status

status is contamination. Therefore it is need multi temporal remote sensing data to determine the area of filled rice paddy fields.

In the schedule at first, the analysis, which combined the MODIS data, was stopped though scheduled. The analysis, which combines the MODIS data, will be done in the future.

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Reference

[1] Ishitsuka N., G. Saito, S. Ogawa and A. Fukuo (2001) RICE PADDY MONITORING USING RADARSAT DATA. Proceedings of the 22nd Asian Conference on Remote Sensing, pp.13-18.