

DETECTION OF FLOODED PADDY FIELDS USING NEW WIDE OBSERVATION MODE OF RADARSAT-2

Naoki Ishitsuka

National Institute for Agro-Environmental Sciences, Ecosystem Informatics Division
3-1-3 Kannondai Tsukuba Ibaraki, 305-8604 JAPAN; TEL:+81-29-838-8229 FAX:+81-29-838-8199
Email: isituka@niaes.affrc.go.jp

KEY WORDS: RADARSAT-2, paddy field, Japan, water, SAR

ABSTRACT: RADARSAT-2 starts new observation mode in this year. I tried to detect flooded paddy fields using the new Wide Fine observation mode, and evaluate usability to comparing with my previous study. The study carried out around Tsukuba city and Ibaraki prefecture, Japan. As a result the accuracy of detection is somewhat lower. However, in this year, transplanting activity was unusual because affect of huge earthquake, tsunami and Fukushima Daiichi nuclear disaster. It is consider that the Fine mode and the Wide Fine mode make no difference much. However swath of the Wide Fine mode is 170km by 150km, against swath of the Fine mode is 50km by 50km. Moreover price of the Wide Fine mode is \$7,500CAD, against price of the Fine mode is \$3,600CAD. Therefore this new wide observation mode are exceedingly useful because of low-cost per area.

1. INTRODUCTION

RADARSAT-2 starts new observation mode, Wide Ultra-Fine, Wide Multi-Look Fine, Wide Standard Quad-Pol, Wide Fine Quad-Pol and Wide Fine, in this year. I tried to detect flooded paddy fields using the new Wide Fine observation mode, and evaluate usability to comparing with my previous study.

2. MATERIALS AND METHOD

2.1 Study area and data used

The study carried out around Tsukuba city and Ibaraki prefecture, Japan (Figure 1). RADARSAT-2 data of Wide Fine mode observed 9 June, 2011. In this area, transplanting of paddy rice carry out early May. Therefore this image is past about one month from transplanting. Paddy fields looks dark because specular reflection. RADARSAT-2 of Fine mode observed 25 August 2008. Almost paddy fields were looks bright because paddy rice were already grow (Figure 2).

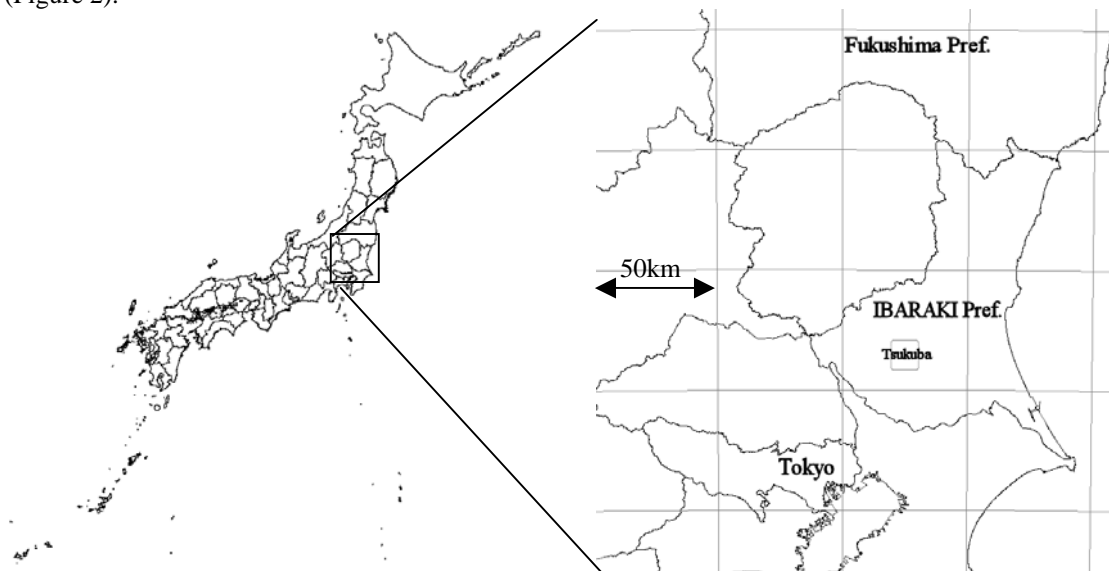
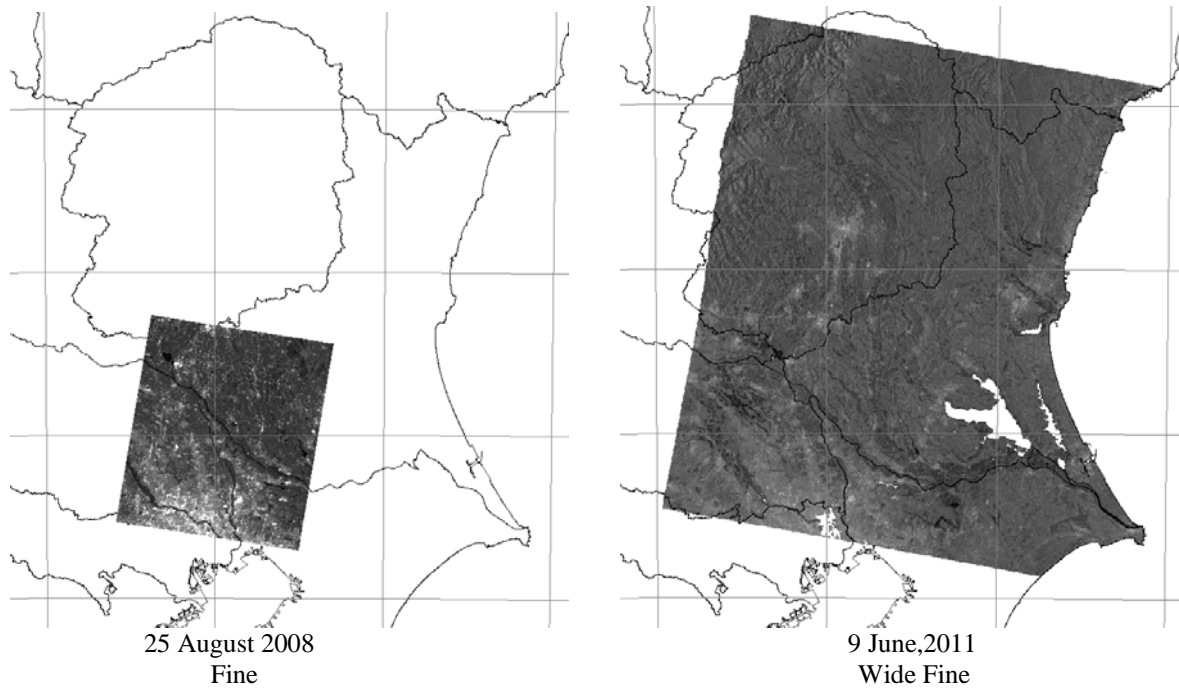


Figure 1 Study area

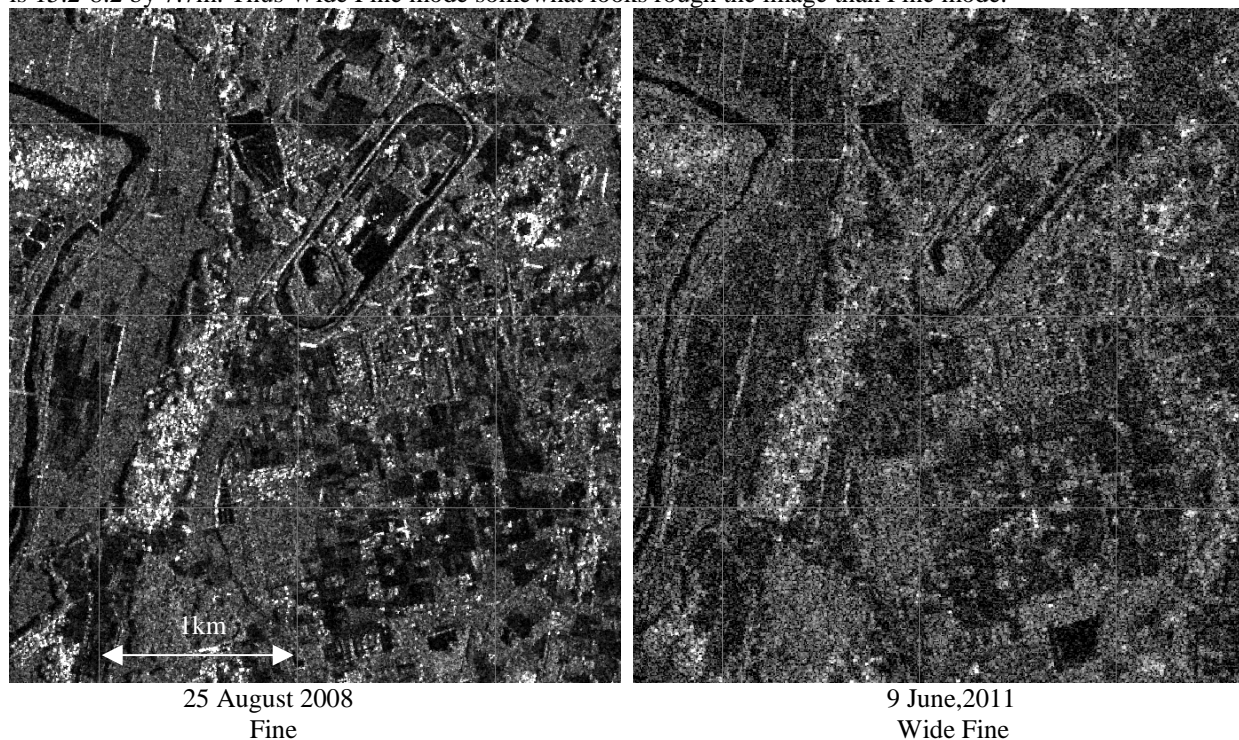


RADARSAT-2 Data and Products (c)MacDONALD, DETTWILER AND ASSOCIATES LTD. 2008 & 20 11- All Rights Reserved

Figure 2 Data used

2.3 Method

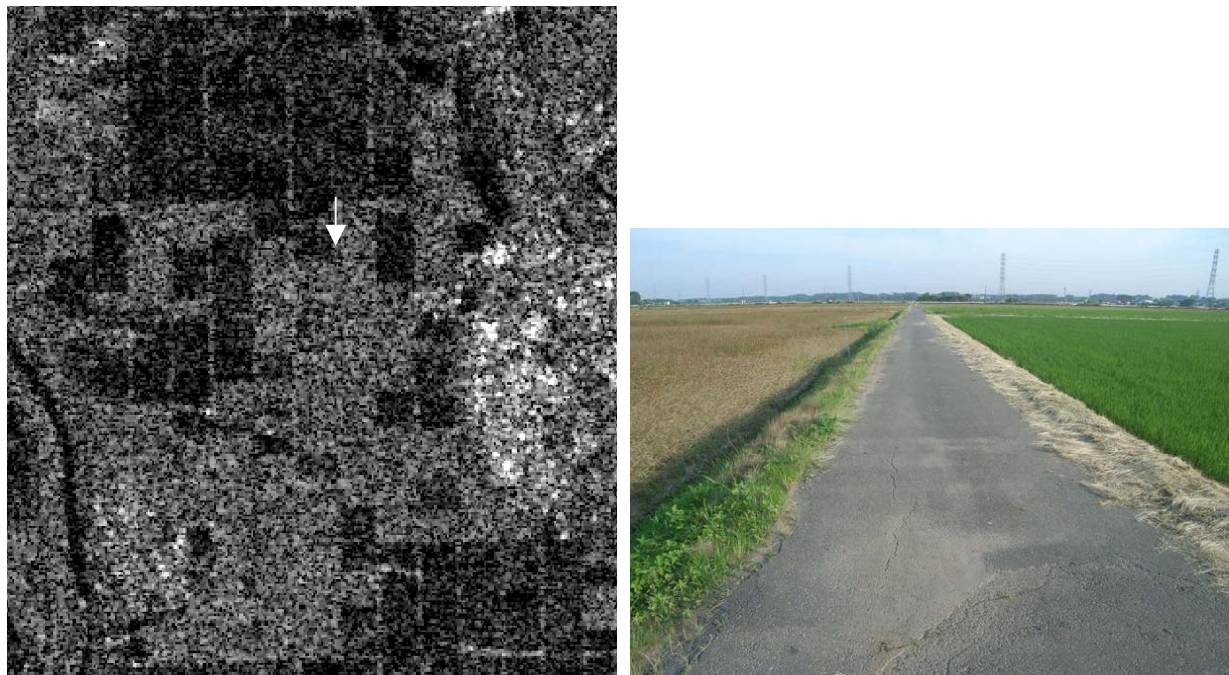
Figure 3 shows same area in the two images. Paddy fields near river are look different because of season. However artificial objects, for example oval test road, are unchanged. Fields looks dark in August image are turf fields. Microwave from satellite occur specular reflection because turf fields area are very flat. Spatial resolution of the Fine mode is 10.4-6.8 by 7.7m. On the other hand, Spatial resolution of the Wide Fine mode is 15.2-8.2 by 7.7m. Thus Wide Fine mode somewhat looks rough the image than Fine mode.



RADARSAT-2 Data and Products (c)MacDONALD, DETTWILER AND ASSOCIATES LTD. 2008 & 2011- All Rights Reserved

Figure 3 Comparison of Fine mode and Wide Fine mode
River runs left side of image. There are paddy fields along with river.

At first I extract agricultural area using GIS data from satellite data. Next threshold of flooded and non-flooded paddy fields computed by histogram of backscatter coefficient. Finally paddy fields under threshold assumed as flooded paddy fields. Validation carried out that compare with ground truth data several points(Figure 3).



RADARSAT-2 Data and Products (c)MacDONALD, DETTWILER AND ASSOCIATES LTD. 2011- All Rights Reserved

Figure 3 Sample of ground truth
Photo taken with arrow place and direction

3. Results and discussion

Accuracy of detection using Wide Fine mode is somewhat lower than Fine mode. It is a natural result. However, in this year, transplanting activity was unusual because affect of huge earthquake, tsunami and Fukushima Daiichi nuclear disaster. Therefore it is consider that the lower accuracy affect not only spatial resolution but also these. The Fine mode and the Wide Fine mode make no difference much. However swath of the Wide Fine mode is 170km by 150km, against swath of the Fine mode is 50km by 50km. Moreover price of the Wide Fine mode is \$7,500CAD, against price of the Fine mode is \$3,600CAD. Therefore this new wide observation mode are exceedingly useful because of low-cost per area. The price/area of Wide Fine mode is about one-five of Fine mode (Table 1).

Table 1 comparison price, area and price/area

| Mode | Price | Area(km ²) | Price/Area(\$CAD/km ²) |
|-----------|------------|------------------------|------------------------------------|
| Fine | \$3,600CAD | 250 | 14.4 |
| Wide Fine | \$7,500CAD | 2550 | 2.9 |

4. Conclusion

I tried to detect flooded paddy fields using the new Wide Fine observation mode of RADARSAT-2, and evaluate usability to comparing with my previous study. As a result the accuracy of detection is somewhat lower. However accuracy of the Fine mode and the Wide Fine mode make no difference much. On the other hand swath of the Wide Fine mode is 2,550km². Moreover price/area of the Wide Fine mode is \$2.9CAD, about one-five of Fine mode. Therefore this new wide observation mode are exceedingly useful because of low-cost per area.

References

http://www.imageone.co.jp/archives/pdf/satellite/RS-2_Product_Details.pdf