FLOOD ANALYSIS USING SATELLITE DATA AND GEOMORPHOLOGICAL SURVEY MAP SHOWING CLASSIFICATION OF FLOOD-INUNDATED AREAS

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ABSTRACT

The study area is the Central plain of Thailand. The region is often suffered from flood for several months. ISODATA clustering method of SAR data can be applied to the low land detection.
Geomorphological survey map showing Classification of flood-inundated areas in this area closely connected with actual flood area Micro-geomorphological survey map showing Classification of flood-inundated areas is effective in flood monitoring. It can be useful in flood damage evaluation.

1 INTRODUCTION

The Central Plain of Thailand is often suffered from flood. _The period and extent of flood is rather large scale._It is very important to delineate the flood extent in order to assess flood damage to agriculture. L-band SAR images will be effective in monitoring flood extent with the advantage of the character of penetrating cloud cover.

Geomorphological survey map showing Classification of flood-inundated areas in this area was made by Drs. H. Ohkura, S. Haruyama, M. Oya Suvit Vibulsresth, et al.
This map indicates the relationships between micro-geomorphological elements such as natural levee and back marsh etc. and the conditions of flood inundation. For example, the part of the category of "Delta3" is long submerged in flood time. The part of the category of "BACK MARSH1" is long submerged in flood time. Depth of stagnation is deepest, swampy in Dry Season also.

The farmers in this area may learn such characteristic of land such as flood-inundation time; depth etc. and they may choose kinds of planting. Soil characteristics such as sandy might be related to micro-geomorphology, too. If the flood extent could be detected by SAR data, we could estimate the flood damage using micro-geomorphological map.

2 DATA and Study Site

The study site is the Central Plain of Thailand. The focused area in this research is the region along Chao Phraya river near Ayutthaya city north from Bangkok Metropolitan.

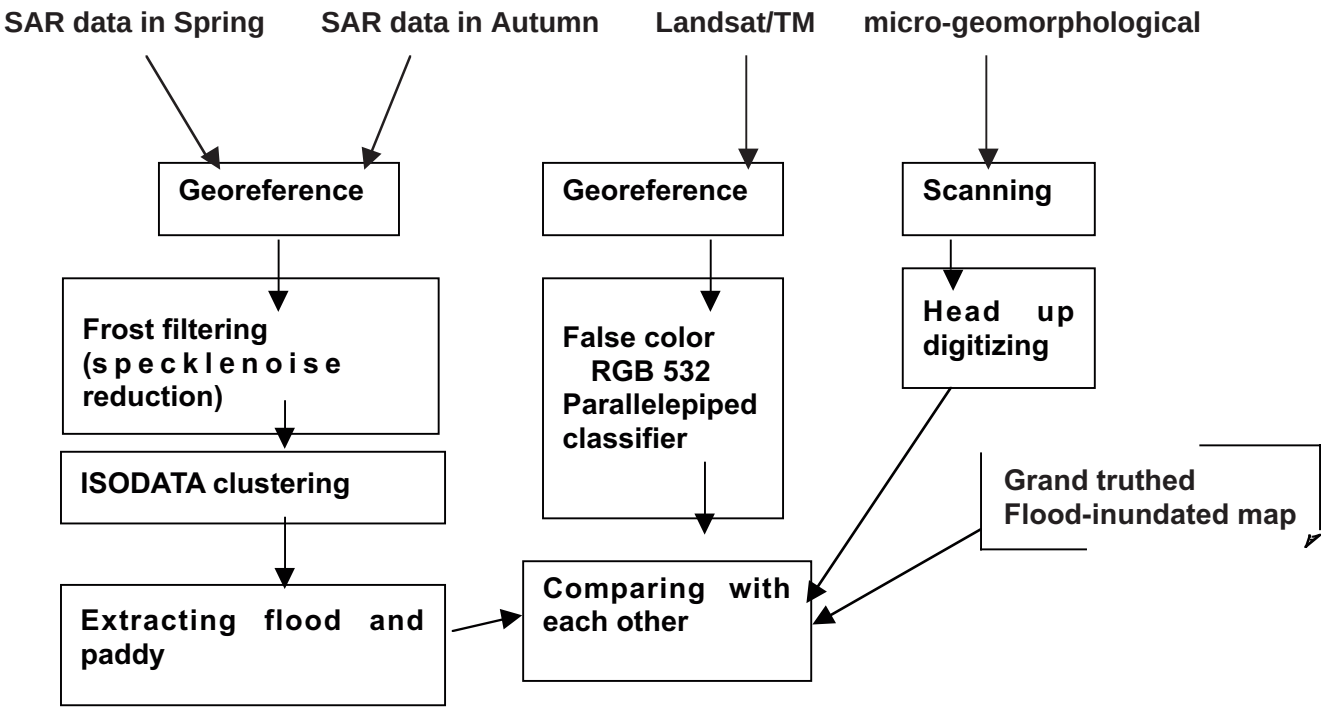
JERS-1 was launched on February 11, 1992 from NASDA's Tanegashima Space Center ; and it has Synthetic Aperture Radar (SAR) and Optical Sensor (OPS). It's SAR wavelength: 23.5cm (L-Band); resolution: 18m*18m; off nadir angle: 35 degree; Polarization: HH. JERS-1/SAR data were acquired on 17/May/1995 and 09/Nov./1995 for path-row// 127-275, 127-276, 127-277; and were gotten on 18/May/1995 and 10/Nov./1995 for path-row//128-274 and 128-275.

Landsat/TM data for 12/Oct./1995 path-row/ 129-49 and 129-50 was used in this research.

_ A Geomorphological Survey Map of the Central Plain of Thailand showing Classification of Flood-inundated Areas 1:250,000 by H. Ohkura, S. Haruyama, M. Oya, Suvit Vibulsresth, et al. (1989) and topological maps 1:250,000 by Royal Thai Survey Department (ND47-3, ND47-4, ND47-7, ND47-8, ND47-11, ND47-12) are based maps in this research.

Final Report : The Study on Integrated Plan for Flood Mitigation in Chao Phraya River Basin (1999) by Japan International Cooperation Agency (JICA) and Royal Irrigation Department Kingdom of Thailand was compared with the result of satellite image analysis.

3 FLOW CHART OF THE ANALYSIS



4 RESULTS

The ISODATA method between the Autumn and Spring SAR data was made as unsupervised classification.(Class number:20) The blue color area (Fig.1) is closely connected with the low land such as back marsh, delta.(Fig.3 and Fig.4)

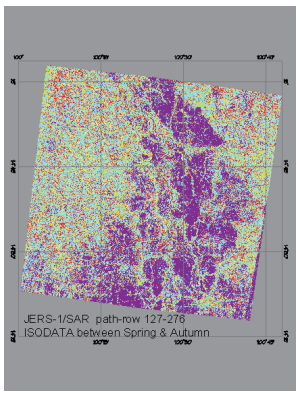


Figure 1. ISODATA clustered data (JERS-1/SAR path-row127-276)

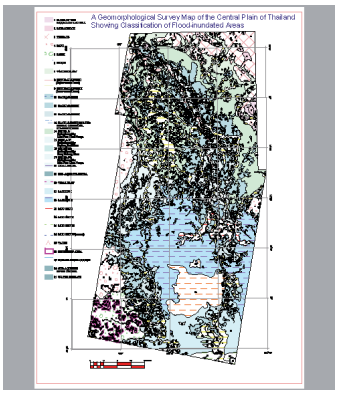


Figure 2. vectored geomorpological map

Figure 3. enlarged ISODATA Category ISODATA

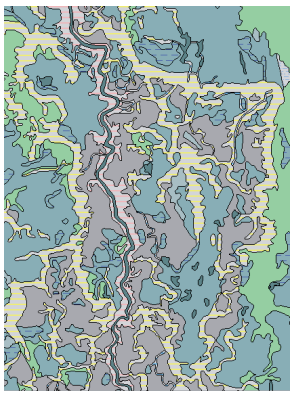


Figure 4. enlarged geomorpholical map (The dark color shows low land)

Never submerged	3
submerged, but drains off well	3 or 7
long submerged	1

Table 1. Relation between geomorphological and ISODATA

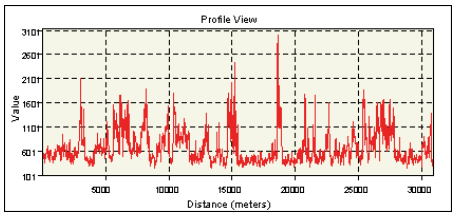


Figure 5. Profile view of JERS-1/SAR/autumn data

It shows profile view of autumn SAR raw data in Fig.5. DN value is fluctuating widely; then the lower place may not be derived from threshold method.

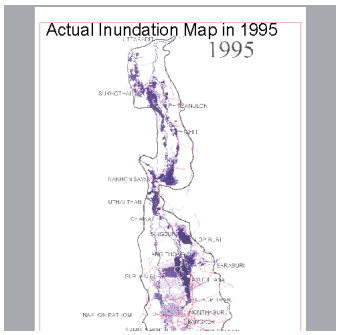


Figure 6. Grand truth map of inundation area (blue color)

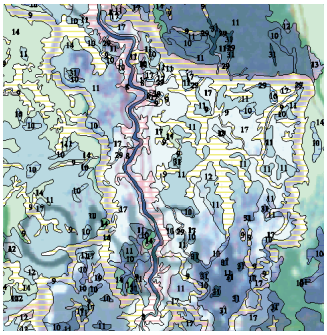


Figure 7. geomorphology and inundated area map

Figure 6. shows grand truth map of inundated area in 1995. The geomorphological map accords with the actual inundation map. (Fig.7)

5 DISCUSSION AND CONCLUSION

(1) Micro-geomorphological survey map showing Classification of flood-inundated areas is effective in flood monitoring. It can be useful in flood damage evaluation.

(2) It can be relation between micro-geomorphology and the result of ISODATA clustering of JERS-1/SAR data According to choose the season of SAR data, micro-geomorphological elements or flood area can be derived from ISODATA clustering.

(3) The flood area detection from threshold method in JERS-1/SAR data is rather difficult. JERS-1/SAR is L-band (HH-polarization) sensor. Then it has an advantage of finding flood area. The following reason why flood area mapping is not easy will be considered:

Thailand is the region of tropical monsoon climate. The wet season starts May and ends about October. There is large paddy field in the Central Plain. They may look the bare soil in the paddy field from the JERS-1 Spring data. And the water surface after flood at the paddy field may be caught from JERS-1 Autumn data.

Then the possible paddy field will be clustered as the same category from JERS-1/SAR.

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