

# LAND USE AND AREAS AT RISK OF FLOODING IN NE THAILAND

## USING LANDSAT TM AND MULTI-TEMPORAL RADARSAT DATA

Tussaporn Thanajaturon and Charat Mongkolsawat



### Abstract

This study aims to explore the watershed areas at risk of flooding with multi-temporal RADARSAT data which are acquired under persistent cloud cover in the Northeast region during the rainy season. The study area, Northeast Thailand, cover an area of about 170,000 km<sup>2</sup> and is drained to the Mekong river by a number of rivers and its tributaries. Multi-temporal RADARSAT data acquired in 2001, 2002, 2003, 2004 and 2007 during the peak of flooding were used.

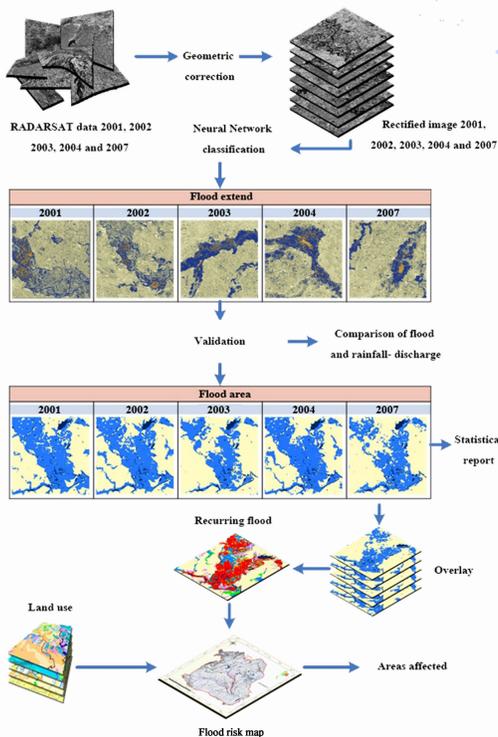
The methodology includes preprocessing of RADARSAT data, establishment of multi-temporal flood extents, overlay analysis of the temporal flood extents and creation of flood risk map. The sub-watershed areas at risk of flooding were mapped and encoded in the GIS-databases. Information obtained can be used for preventive measures in advance and is available for the communities affected and organization concerned.

### Introduction

The flood events in The Northeast caused in asset damages, loss of life and crop failures. Several programs of the government rescues were launched at the time of flooding. No significant long term of the flood prevention has been implemented after the events. With the advent of remote sensing technology cloud penetrating capability of imaging with SAR, a new geo-informatics approach to predicting flood has been developed. RADARSAT/ ALOS data provide information to map the flood extent for vast area.

### Method

Flood-risk map, based on the recurring flood extent. The recurring flood extent and flood damage assessment in the Northeast was established, based on the flood events in 2001 2002, 2003, 2004, and 2007. The schematic chart of the methodology is presented in Fig. 2



### Study area

The study area encompassed most of Northeast Thailand, with an approximate area of 170,000 km<sup>2</sup>, between 14° 14' N to 18° 27' N and 101° 15' E to 105° 35' E (Fig. 1)



Fig. 1 Study area

### Results

#### 1. Flood extent

Table 1 show the areas of inundation for the years 2001, 2002, 2003, 2004, and 2007, relevant to the flood extent.

Table 1 Flood areas in the Northeast Thailand

Year	Flood area (km <sup>2</sup> )	Percent
2001	4,790.37	2.84
2002	8,854.68	5.24
2003	3,148.28	1.86
2004	4,175.83	2.47
2007	4,147.25	2.46

Total area of the Northeast = 168,825.34 km<sup>2</sup>

#### 2. The recurring flood extent

The Fig. 3 provided the recurring flood extent as a result of the 5-year flood. The proportion of the recurring flood in terms of area is summarized in Fig. 4.

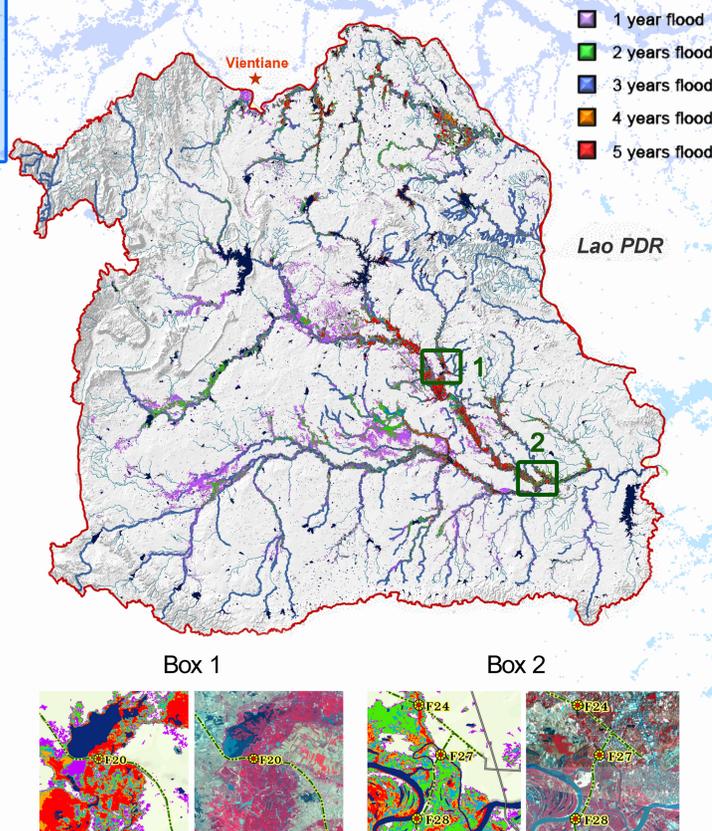


Fig. 3 The areas of inundation of the 2007

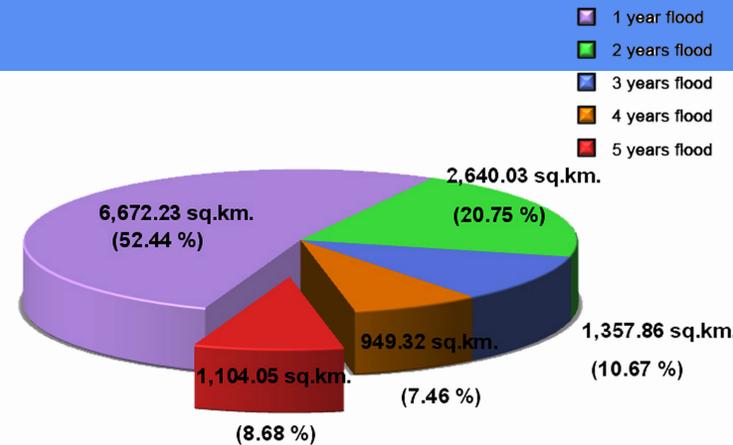


Fig. 4 The proportion of the recurring flood

#### 3. The recurring flood extent and village affected and land use

The model predicted that the villages affected are 3,820, 1,576, 815, 619 and 839 villages for 1 year, 2 year, 3 year, 4 year and 5 years flood, respectively.

Overlaying the recurring flood areas over the land use layer the land use types affected by the flooding could be identified. The areas highly affected by the flooding were restricted to low land paddy field or about 72- 79% of the total flood area. The areas of 11,981.25 sq.km of rice crop were severely damaged, estimating the damages within the risk area, based on minimum cost of paddy it may reach 2,995 million baht. As a result advance strategy for protection is suggested to minimize the damages. These may result from sediment deposits, flow obstruction of infrastructure, human activities, misuse of land, time lag of drainage system and etc.

### Conclusion

In conclusion, the flood risk estimation is a very promising RADARSAT application. SAR data has been shown to be very useful in the tropical region where the cloud cover is persistent during the rainy season. The repeating pattern of flood is found with certain extent depending upon the amount of prolonged rainfall, time lag of flow and watershed characteristics. Lists of sub-catchments at high risk of flooding within the Mekong, Chi and Mun in the Northeast are available. The flood characteristics in terms of the extent of inundation for a given discharge of water have high relationship with discharge of water. Floods in the Northeast occur mostly on lowland as a result of flow exceeding the capacity of stream channels and overspilling the banks. Some areas are subject to flooding as a results of water surface ponding.

### Reference

Brown, R.J., Brisco, B., D'lorio, M.A., Prevost, C., Ryerson, R.A. & Singhroy, V. (1996). RADARSAT Applications: Review of GlobeSAR Program. Canadian Journal of Remote Sensing, Vol. 22, No. 4 , 1996, pp. 404-419.