

The 14th South East Asia Survey Congress 2017 (SEASC2017)

# LAND COVER EXTRACTION OF COASTAL AREA FROM SATELLITE IMAGERY USING ONTOLOGICAL METHOD

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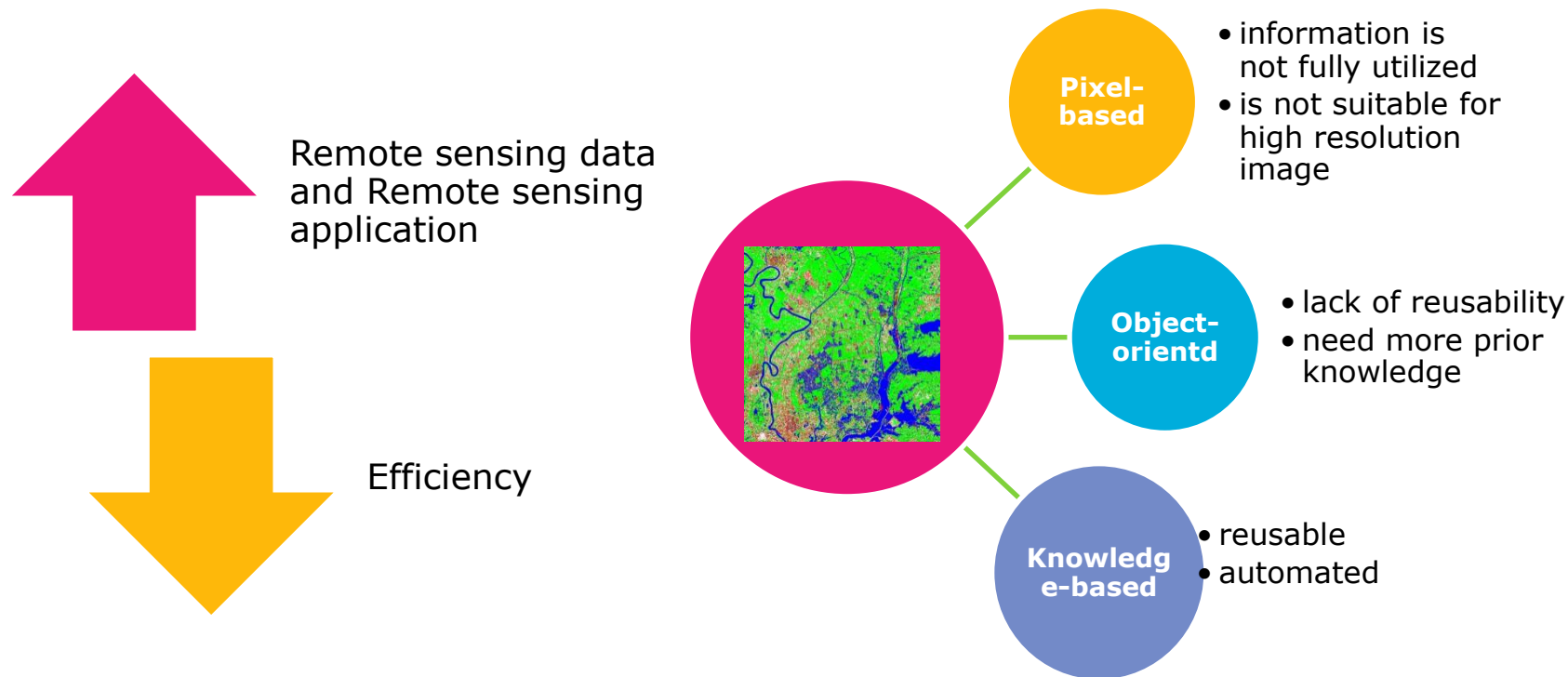
1

# INTRODUCTION



# INTRODUCTION

Remote sensing data is widely used in different application fields nowadays. In China's Geographic Census, it requires the monitoring of fundamental geographic information in China annually, most of the geographic information is associated with land cover, and medium and high resolution remote sensing data is used in the manual delineation work.



# INTRODUCTION

Problem of Beibuwan Gulf monitoring:

- ❑ Narrow and long seashore area
- ❑ Needs frequent monitoring
- ❑ Limited image acquisition

## DATA

Wide coverage

Moderate resolution

Good acquisition

Good accuracy

## METHOD

Automated

Easy and fast

Knowledge-based

Reusable



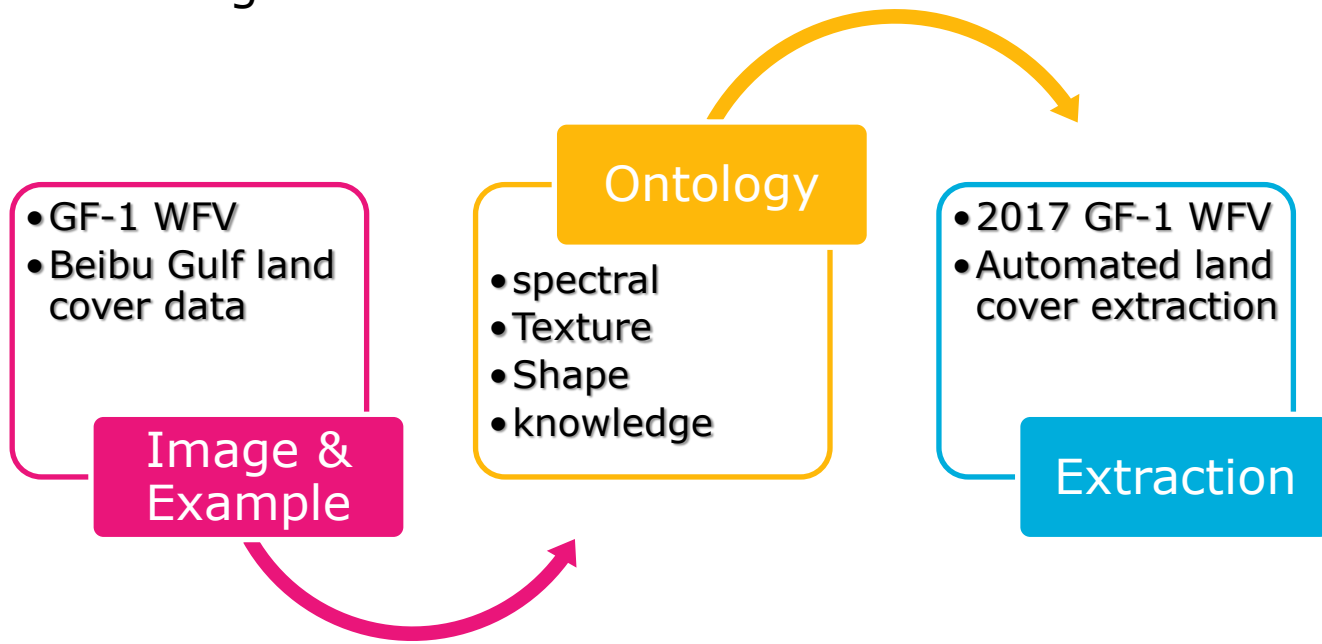
Normal high resolution satellite image



GF-1 Wide Field View image

# INTRODUCTION

This study makes attempt to monitor the land cover of Guangxi coastal area using GF-1 WFV data with ontological method. The land cover ontology for this area is established first via image feature analysis. Using this ontology, automatic image extraction from GF-1 WFV data of subsequent monitoring time is realized.



2

# DATA AND METHODS





# DATA

GF-1 is the first satellite in the Chinese high resolution earth observation system. It was launched on Apr. 26, 2013.

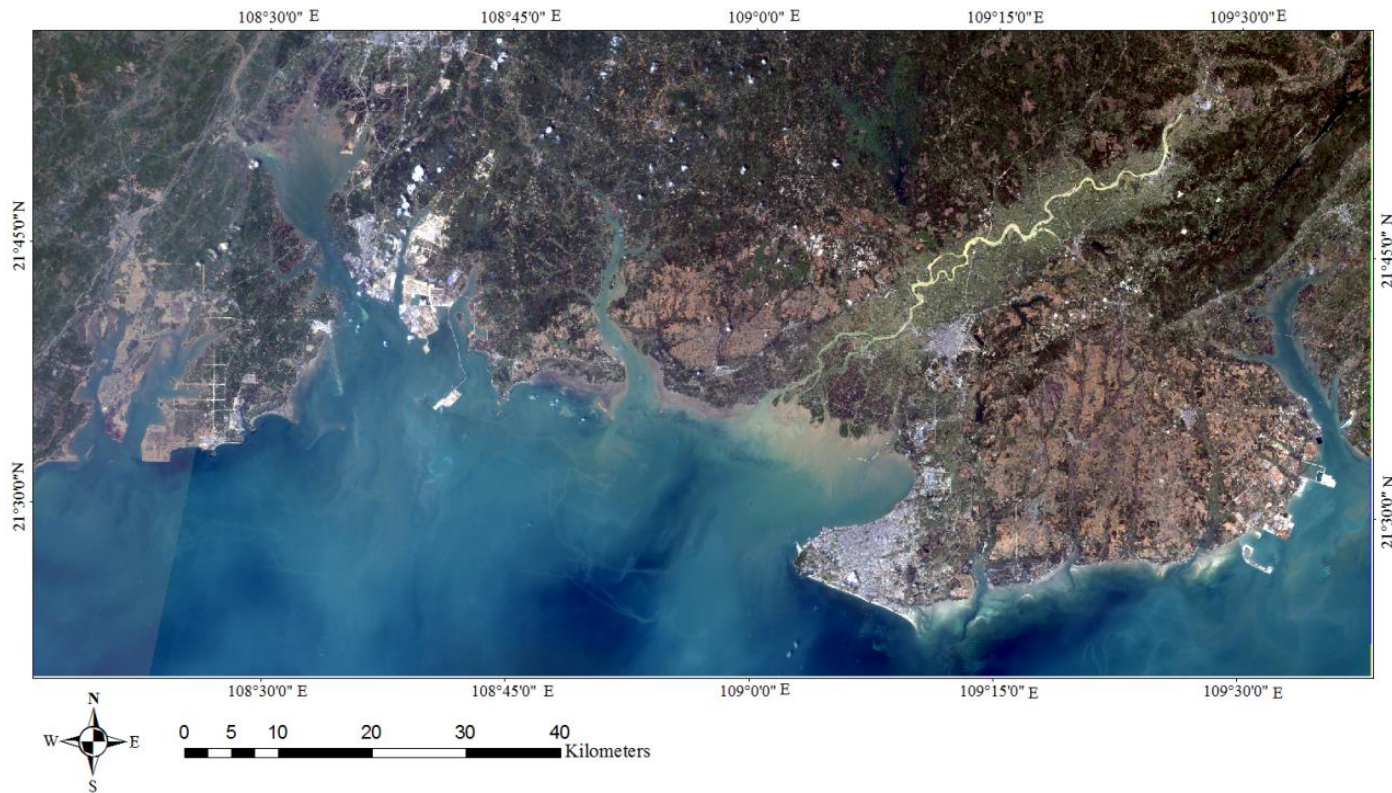


Item	2-meters panchromatic 8-meters multispectral camera		16-meter multispectral camera
SPECTRAL RANGE	panchromatic	0.45—0.90 $\mu$ m	
	multispectral	0.45—0.52 $\mu$ m	0.45—0.52 $\mu$ m
		0.52—0.59 $\mu$ m	0.52—0.59 $\mu$ m
		0.63—0.69 $\mu$ m	0.63—0.69 $\mu$ m
		0.77—0.89 $\mu$ m	0.77—0.89 $\mu$ m
SPATIAL RESOLUTION	panchromatic	2m	16m
	multispectral	8m	
SWATH WIDTH	60km ( 2 cameras )		800km ( 4 cameras )
COVERAGE CYCLE (side-look)	4天		
COVERAGE CYCLE	41天		4天

# DATA

The study area is part of the Beibu Gulf shore in Guangxi, China. In this case, frequent, accurate and large scale land cover monitoring is necessary.

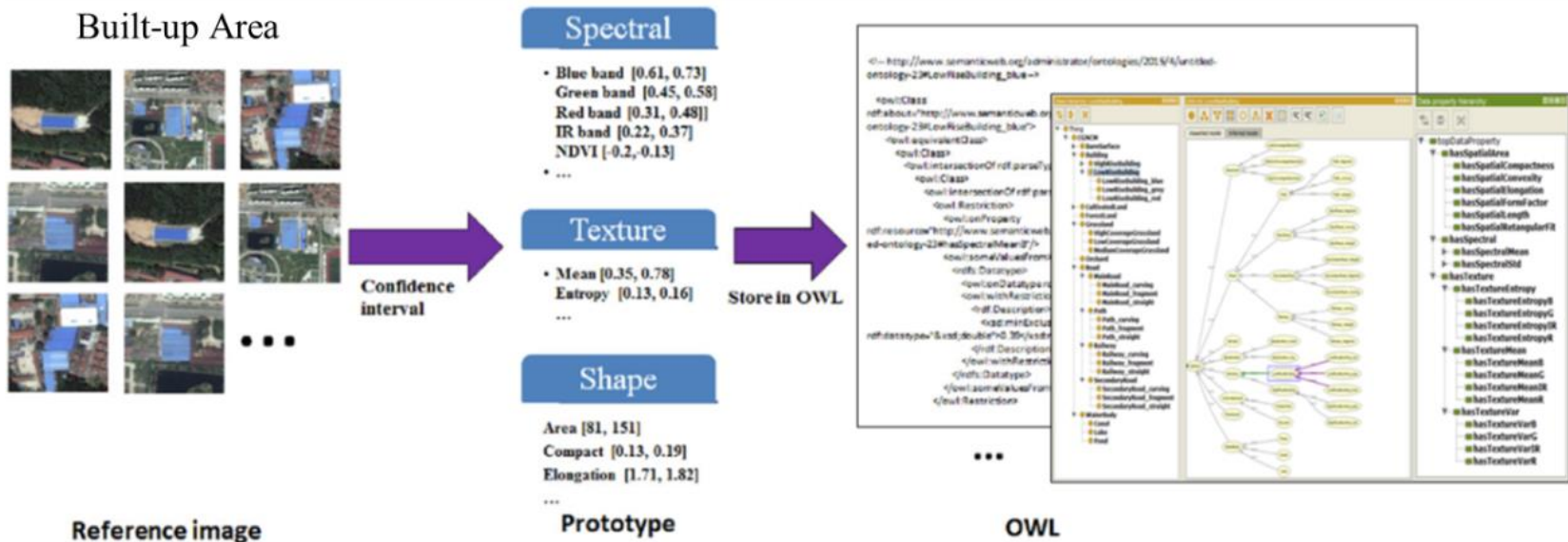
Therefore, GF-1 WFV data is useful in our work of land cover monitoring for Beibuwan Gulf. We use the two GF-1 WFV images acquired from GF-1 WFV1 camera and WFV2 camera respectively, on April 1st, 2017.



## METHOD

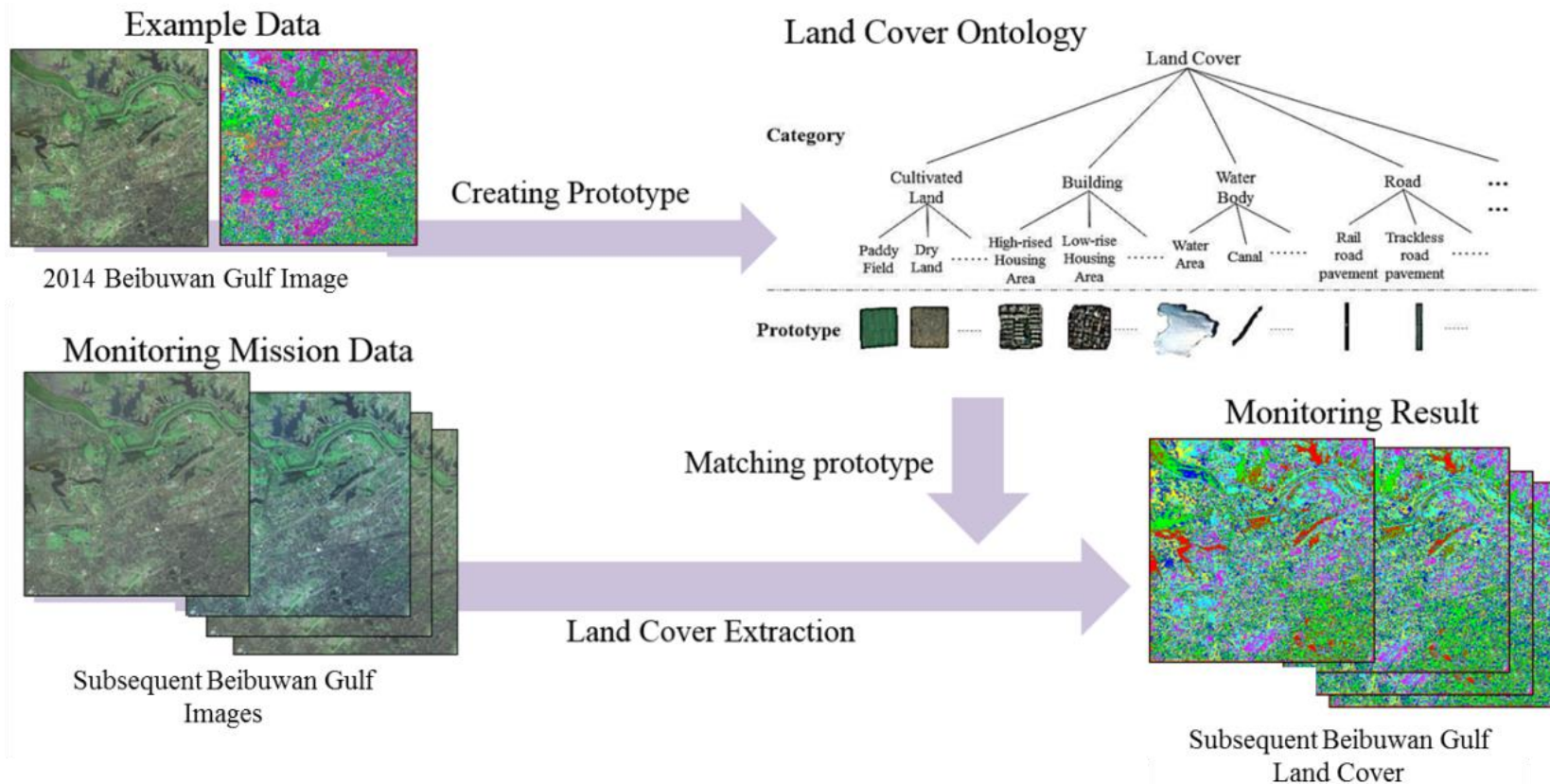
(1) Create land cover ontology for Beibu Gulf

To achieve the ontology-based extraction of land cover in the coastal area, firstly we establish ontology with hierarchical system, classes, and properties for the land cover according to the China fundamental geographic information category used in CGNCM. Properties of land cover includes the spectral feature, texture feature, spatial feature, and the segmentation scale, with which the feature of land cover class on remote sensing image is formally represented.



# METHOD

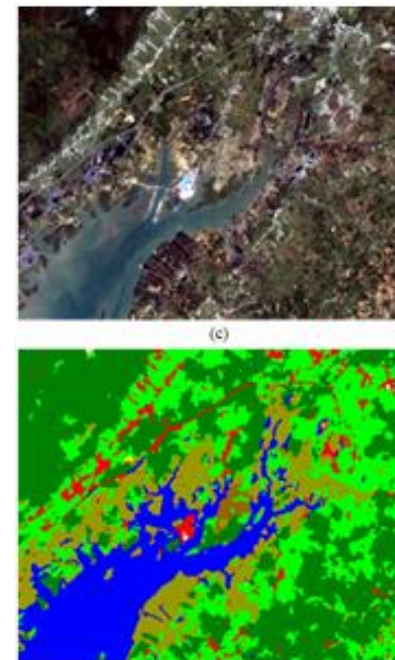
## (2) Create prototype for land cover classes





# METHOD

## (3) *Ontology-based Land Cover Extraction*





3

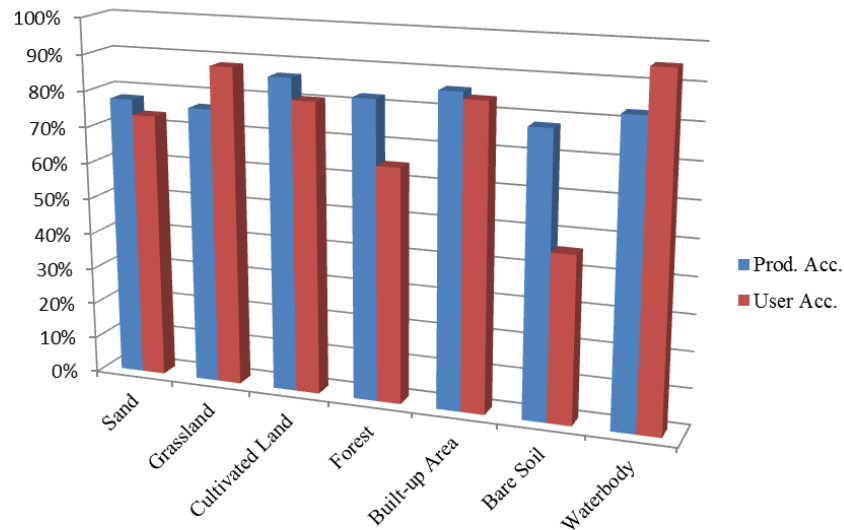
# RESULTS AND DISCUSSIONS



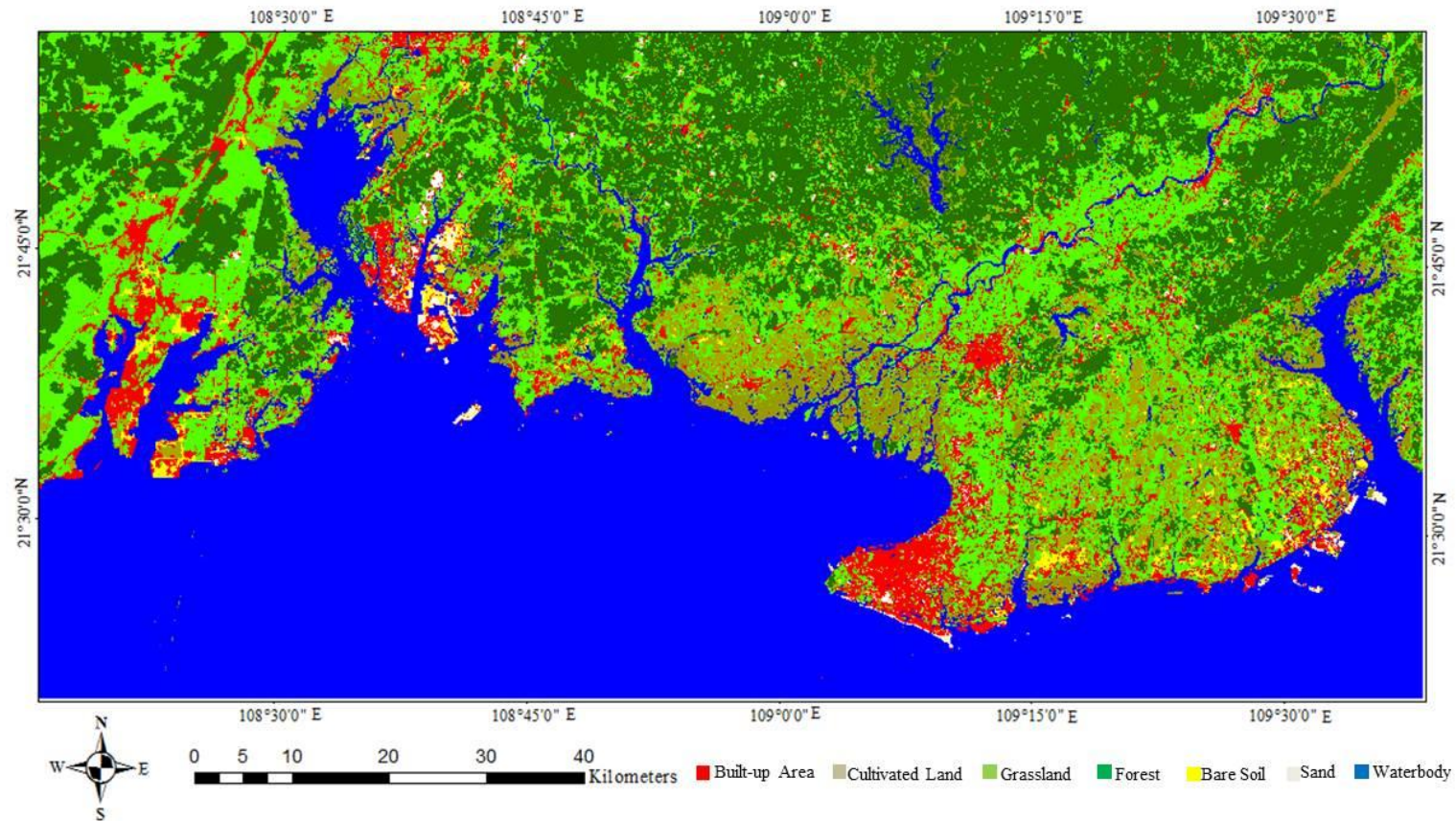
# RESULTS AND DISCUSSIONS

In order to evaluate the quality of this interpretation, we used the ground truth provided by the expert to compute confusion. The Kappa coefficient of the experiment is 0.47, and the overall accuracy is 0.80.

	Prod. Acc.	User Acc.
Sand	77.61%	73.45%
Grassland	76.48%	88.23%
Cultivated Land	86.39%	80.53%
Forest	82.36%	64.76%
Built-up Area	85.73%	83.88%
Bare Soil	78.02%	46.00%
Waterbody	82.86%	94.95%
Overall Acc.	80.11%	



# RESULTS AND DISCUSSIONS



# RESULTS AND DISCUSSIONS



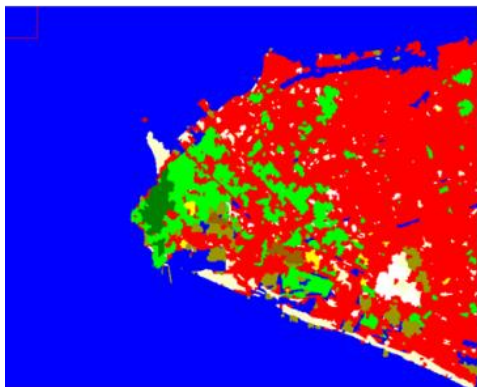
(a)



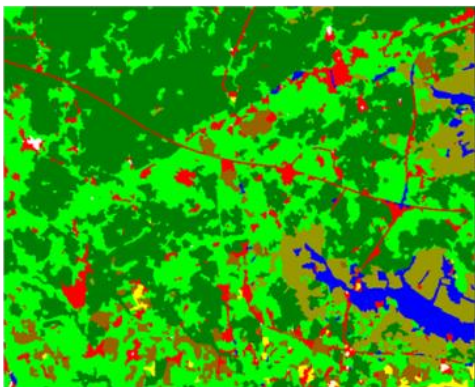
(b)



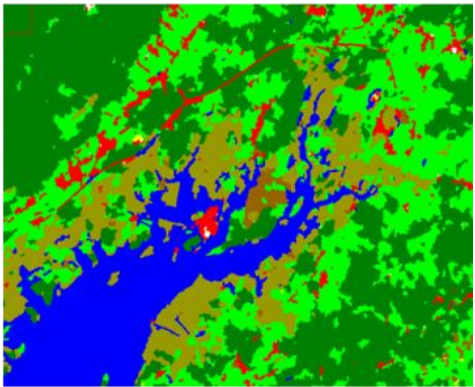
(c)



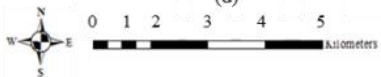
(d)



(e)



(f)



■ Built-up Area   ■ Cultivated Land   ■ Grassland   ■ Forest   ■ Bare Soil   ■ Sand   ■ Waterbody

# 4

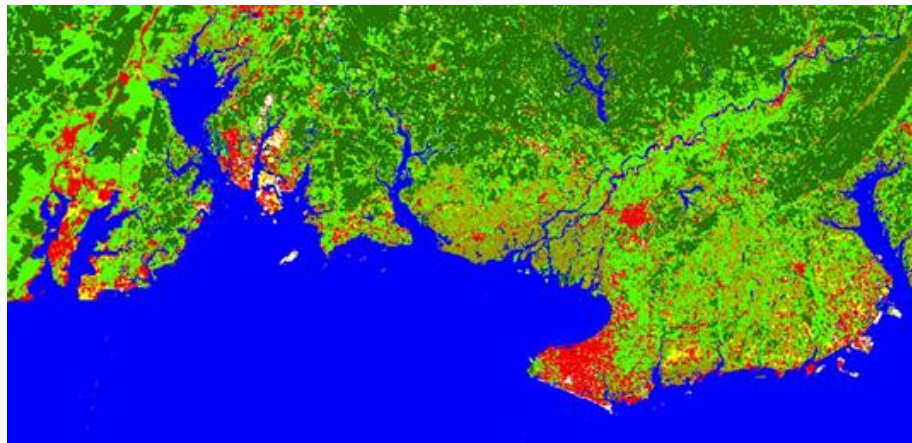
## CONCLUSIONS





# CONCLUSIONS

Our study proposes an ontology-based image extraction method for land cover in Beibuwan Gulf shore in Guangxi, China. The land cover ontology is first established for study area, including spectral, texture, and shape properties. Referenced land cover map and GF-1 WFV image are then used to create a land cover regional prototype for the study area, which is stored in an OWL file. Land cover extraction experiment is then conducted for the study area the year after the referenced year.



# CONCLUSIONS

## RESULTS

- ontology can help to organize land cover extraction knowledge
- automation extraction could be done according to the established ontology

## CONTRIBUTIONS

- attempt to use ontological method and prototype for land cover extraction in coastal area
- provide an automatic, efficient, and less expert knowledge-dependent way for land cover monitoring

## ADVANTAGES

- reusability of knowledge of land cover
- automated extraction
- fast covers wide coastal area with GF-1 WFV data

# GUANGXI SATELLITE DATA AND APPLICATION CENTER



GUANGXI BRANCH OF  
SATELLITE SURVEYING  
AND MAPPING  
APPLICATION CENTER

- Mapping satellite
- Stereo mapping
- High accuracy



GUANGXI DATA AND  
APPLICATION CENTER OF  
HIGH RESOLUTION  
EARTH OBSERVATION  
SYSTEM

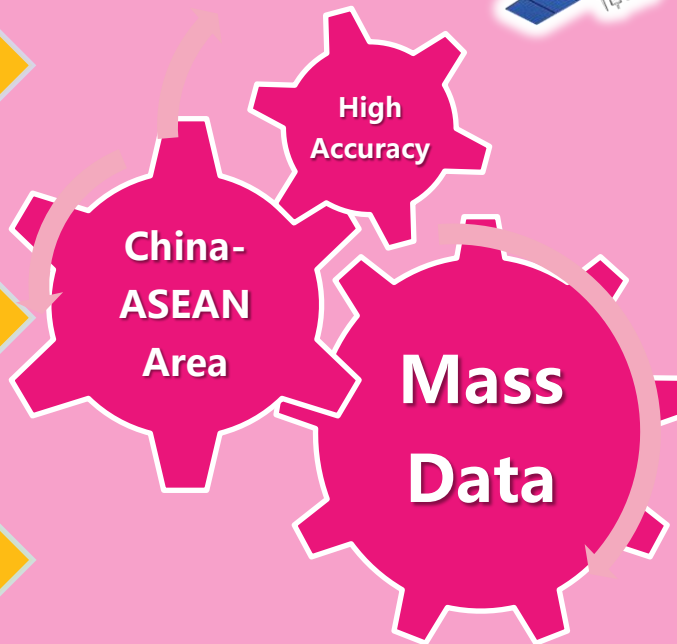
- High resolution
- Multi source
- Different application



GUANGXI BUREAU OF  
SURVEYING, MAPPING  
AND GEOINFORMATION

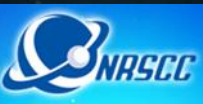
- Mass GI data
- LBS

## Earth Observation Data Integration





# GUANGXI SATELLITE DATA AND APPLICATION CENTER



资源三号01星

ZY

2m panchromatic  
Stereo  
5 days co

北京二号B

## TripletSat-2

0.8m par  
3.2 mult  
1 day coverage cycle

## Coverage of ASEAN area

## GF-2

0.8m panchromatic  
3.2m multispectral  
4 days coverage cycle

## GF-5, GF-7.....



# GUANGXI SATELLITE DATA AND APPLICATION CENTER

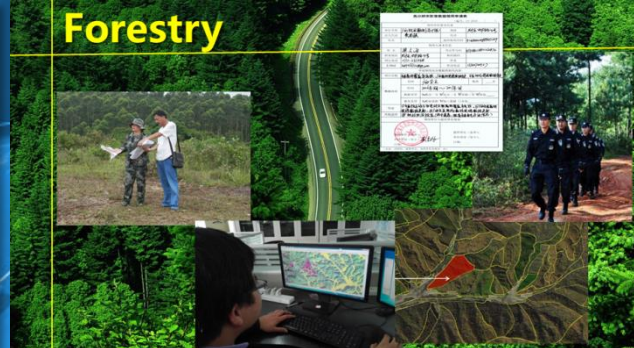
## Surveying and Mapping



## Land Management



## Forestry



- 10+ years of experience
- 15+ RS applications
- 5000+ images used

# READY FOR ASEAN USERS!

GUANGXI DATA AND APPLICATION CENTER OF HIGH RESOLUTION EARTH OBSERVATION SYSTEM

GUANGXI BUREAU OF SURVEYING, MAPPING AND GEOINFORMATION

GUANGXI BRANCH OF SATELLITE SURVEYING AND MAPPING APPLICATION CENTER

- Covers whole Guangxi
- Covers ASEAN area
- 1 m highest GSD
- Multi-source data

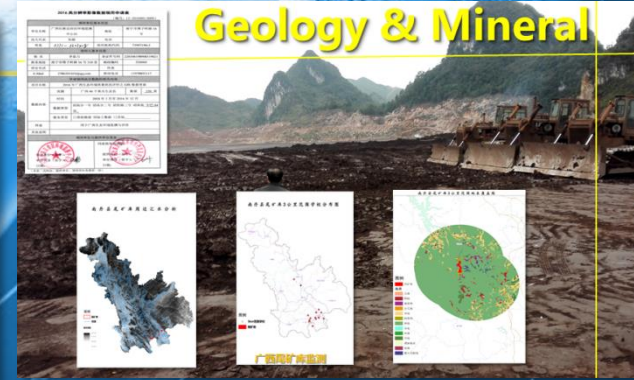
## Agriculture



## Environment



## Geology & Mineral





The 14th South East Asia Survey Congress 2017 (SEASC2017)

# THANKS



GEOMATIC CENTER OF GUANGXI  
GUANGXI BRANCH OF SATELLITE SURVEYING AND MAPPING APPLICATION CENTER  
GUANGXI DATA AND APPLICATION CENTER OF HIGH RESOLUTION EARTH OBSERVATION SYSTEM

