THE IMPACTS OF URBANIZATION ON SURFACE ALBEDO IN THE YANGTZE RIVER DELTA

INTRODUCTION

06/02/2011

Mélanie Bourré

Motivation

Since the 20th century, there has been a rapid urbanization of the world population.

United Nation prediction (2006) : 60% of the world population will live in cities by 2030.

In these newly urbanized area, we observe a local climate change : « Heat Island Effect ».

Although it affects many people, the relationship between urbanization and local climate change is not well understood.

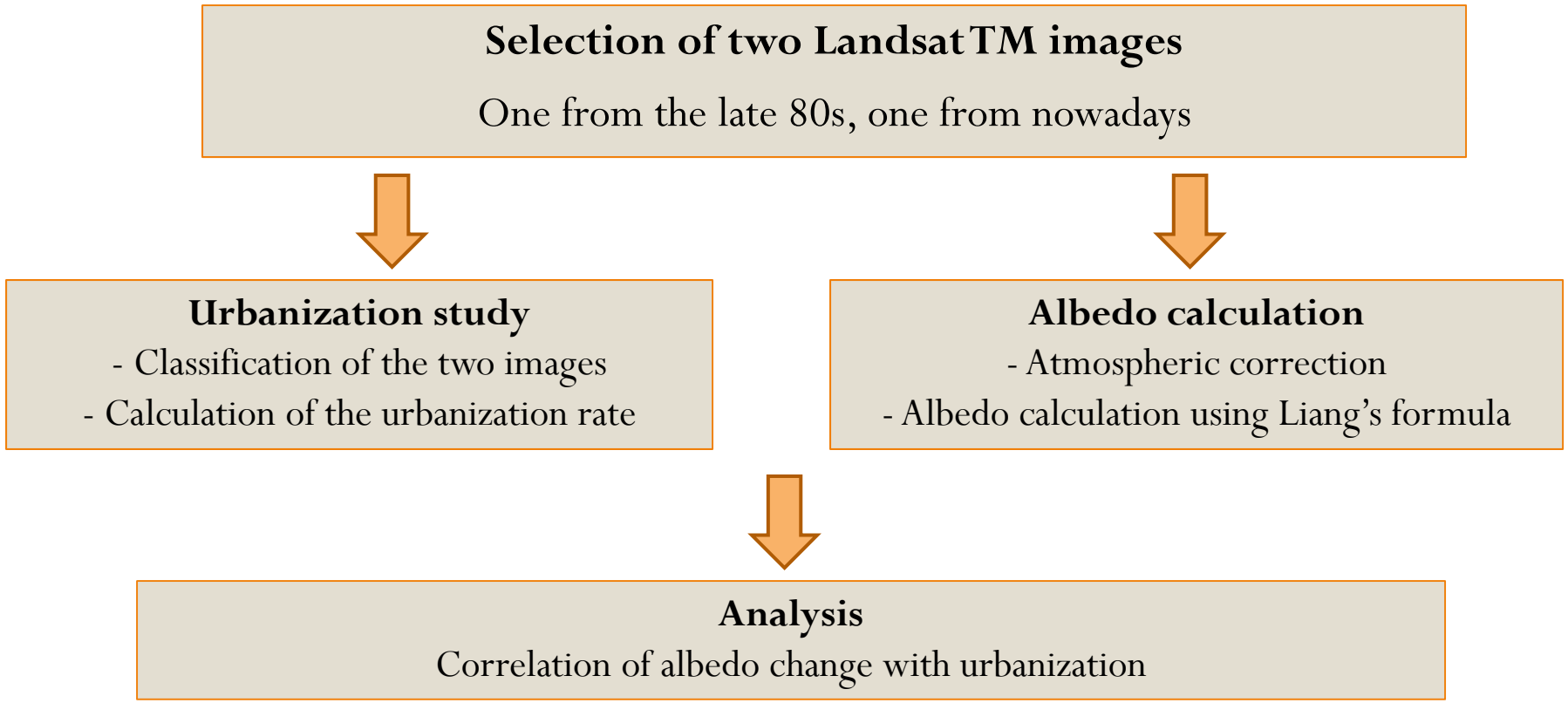
However, the role of surface properties on climate has been recognized by many recent studies.

Urbanization → Surface albedo change → Climate change.

Methodology

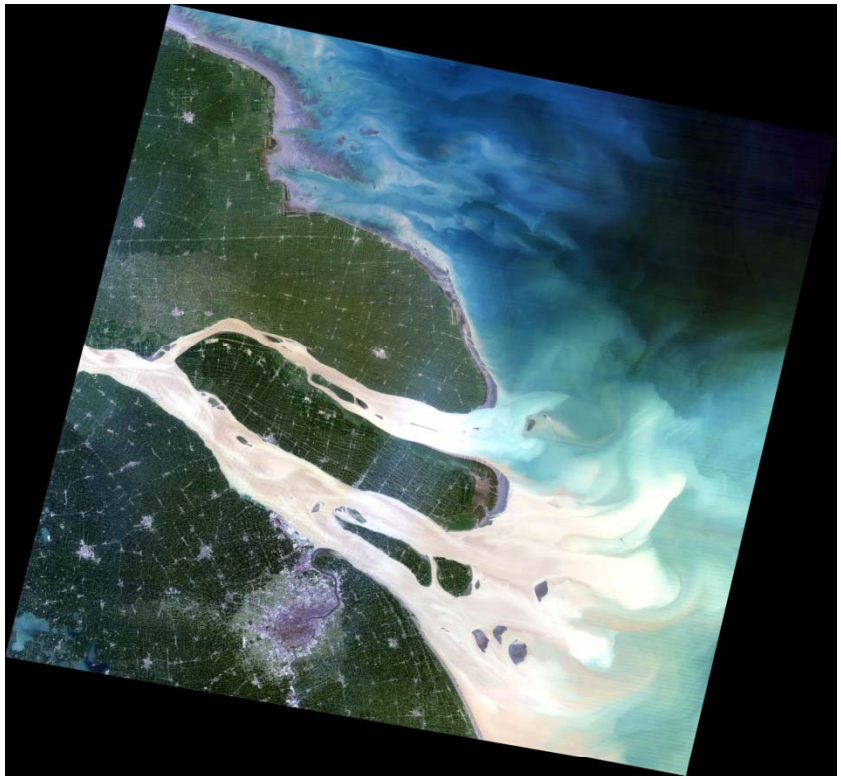
Remote sensing data.

Processed and analyzed by ENVI software.



Study area

Mouth of Yangtze River Delta in China



www.landsat.org Acquisition date : 08/11/1989

Yangtze River Delta :

- One of the most industrialized and urbanized region of China.
- Highest population density of China.

Coordinates :

Long : 120°39'E Lat : 32 °40'N

Path : 118 Row : 38

Area : ~35000 km²

Source : www.chinatouristmaps.com

Two provinces : - SE Jiangsu

- NE Shanghai

Environment

- **Geology**

Alluvial plain

Elevation : 4m

- **Hydrology**

Delta

Numerous rivers and lakes

Maze of intersecting canals

- **Climate**

Humid subtropical climate

- **Vegetation**

Subtropical broad-leaf evergreen.

Human_activities

- **Primary sector**

Agriculture

Fisheries

Aquaculture

- **Secondary sector**

Traditional center of textile industry

Industrial base advancing new technology

Import/Export

- **Tertiary sector**

Commerce and finance

- **Transportation**

Satellite Images

Source : www.landsat.gsfc.nasa.gov/images/media.html

Source : Global Land Cover Facility

www.landcover.org

Author	NASA Landsat Program	NASA Landsat program
Publication Date	05/16/2001	May 2007
Collection Name	**Landsat 5 TM scene**	**Landsat 7 ETM+ scene SLC-off Gap-filled products**
Image Name	ID 201-985	ID 217-852
Processing Level	Ortho, GLS 1990	Ortho, GLS2005
Publisher	USGS	USGS
Publisher Location	Sioux Falls	Sioux Falls
Product Coverage Date	**08/11/1989**	**08/15/2005**

Image preprocessing

- **Picture cut**

Pictures of different sizes

Band issues on the left and right sides of the 2005 image

→ Cut the pictures with ENVI software

- **Geometric and radiometric correction**

Performed by USGS

- **Atmospheric correction**

No clouds or hazes → No atmospheric correction needed

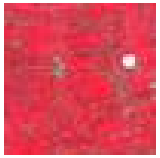
- **Image enhancement**

Automatic linear contrast stretching of 2% by ENVI

Visual interpretation

Color infrared composite

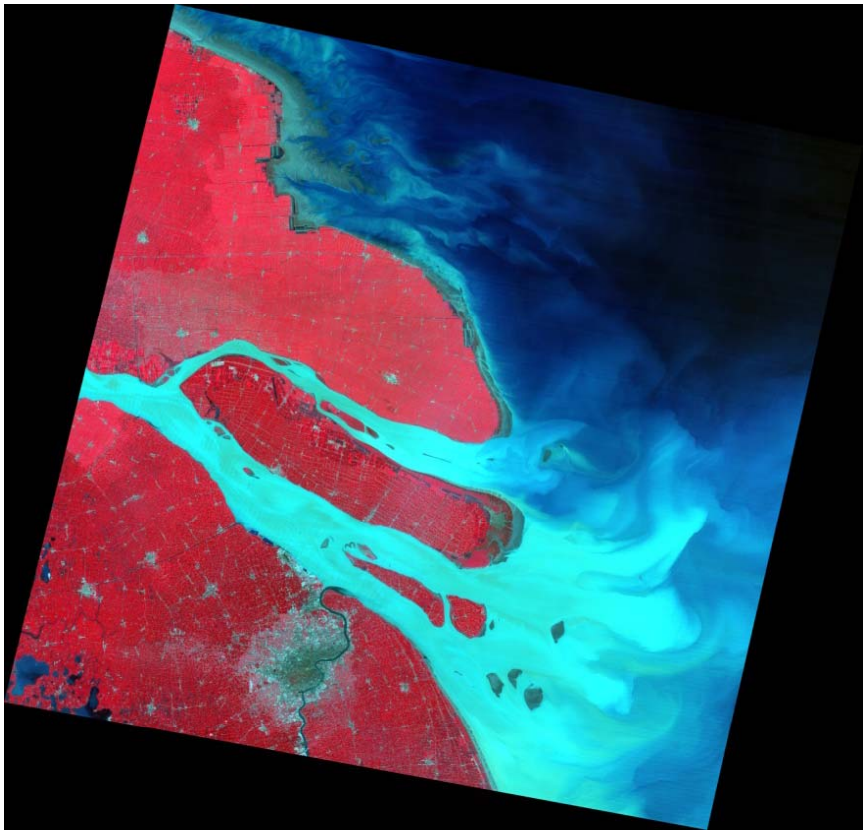
Color displayed	Band	Spectrum region
Red	4	NIR
Green	3	Visible Red
Blue	2	Visible Green

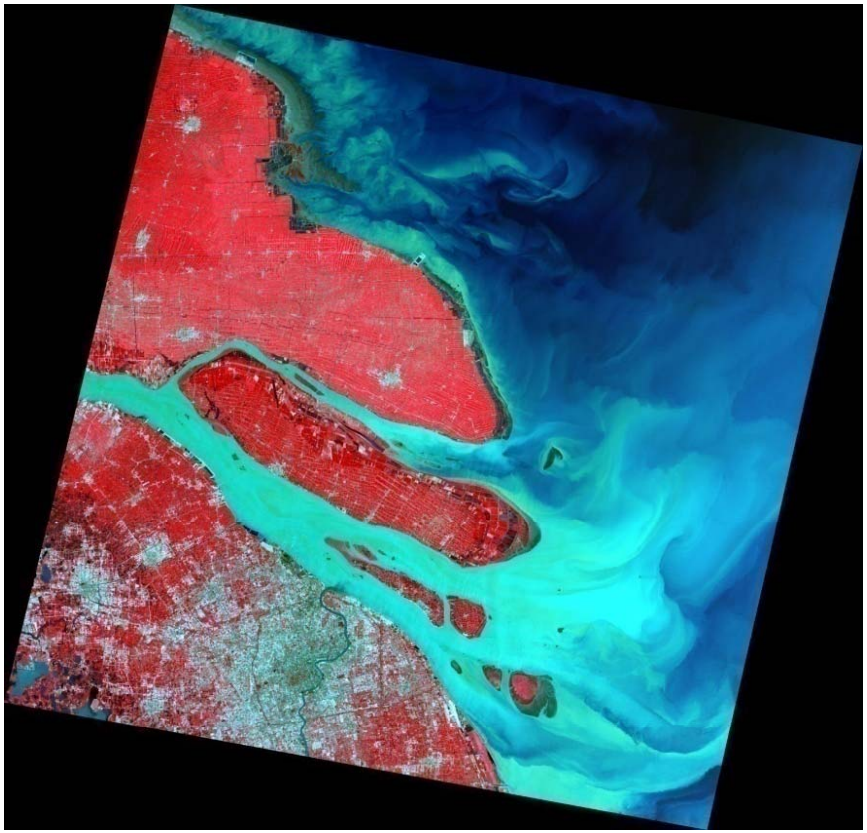
Area type	Urban area	Vegetation	Water
Sample			

08/11/1989

08/15/2005

Yangtze River Delta

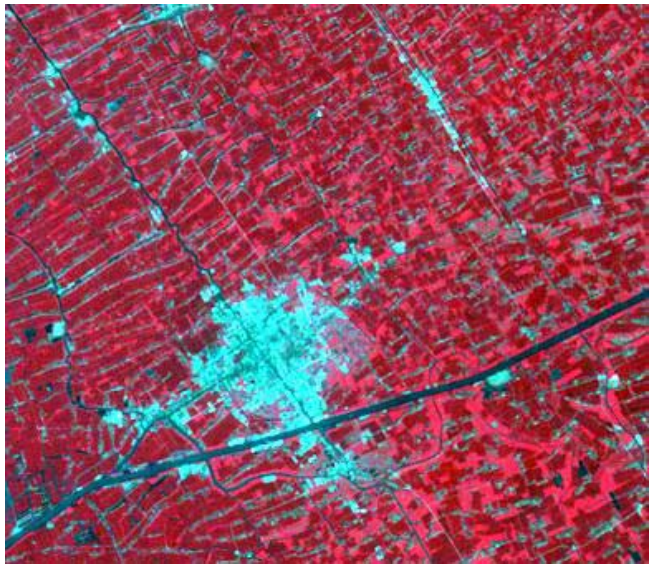




- 08/11/1989

- 08/15/2005

Taicang



Aquaculture

Classification

Methodology :

Classification processed on the Digital Numbers within the 6 non thermal bands.

Unsupervised classification

ISODATA algorithm *ENVI Software*

Identification with ground reference data

↓

Choice and definition of classes

↓

Supervised classification

Maximum Likelihood Classifier *ENVI Software.*

↓

Accuracy assessment

Unsupervised classification

Aim : Evaluate the separability between classes and so guide the supervised classification.

Principle: - The software groups together pixels of similar spectral pattern.

ISODATA algorithm

- The analyst identifies the clusters.

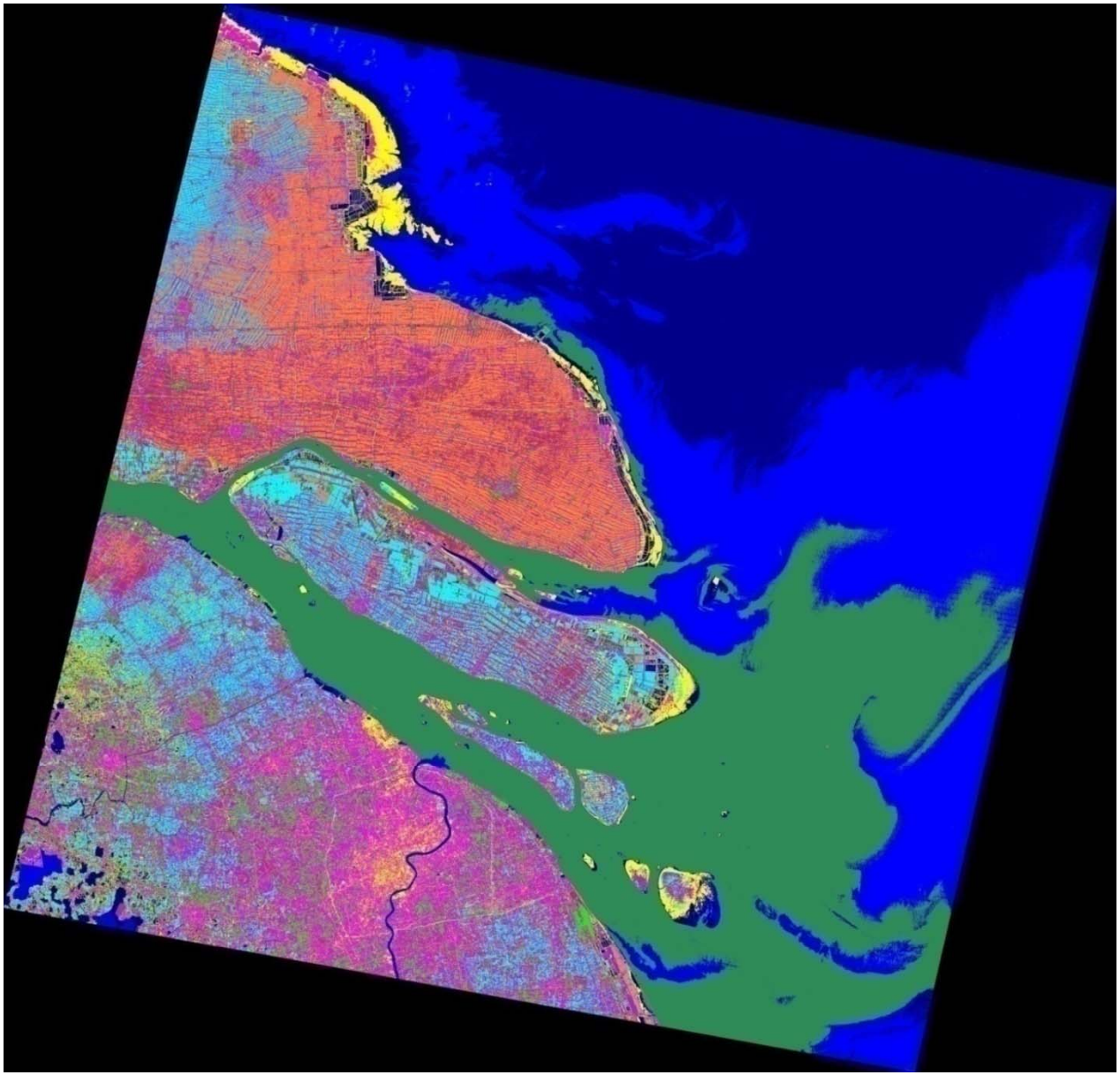
Chosen parameters :

Number of classes : Between 5 and 10

Number of iterations : 10

Change Threshold : 5%

08/15/2005 Unsupervised classified image



Ground reference data

Google Earth 08/23/2005

And panorama pictures

Atlas of China, Du Xiurong, 2007

Spectral patterns

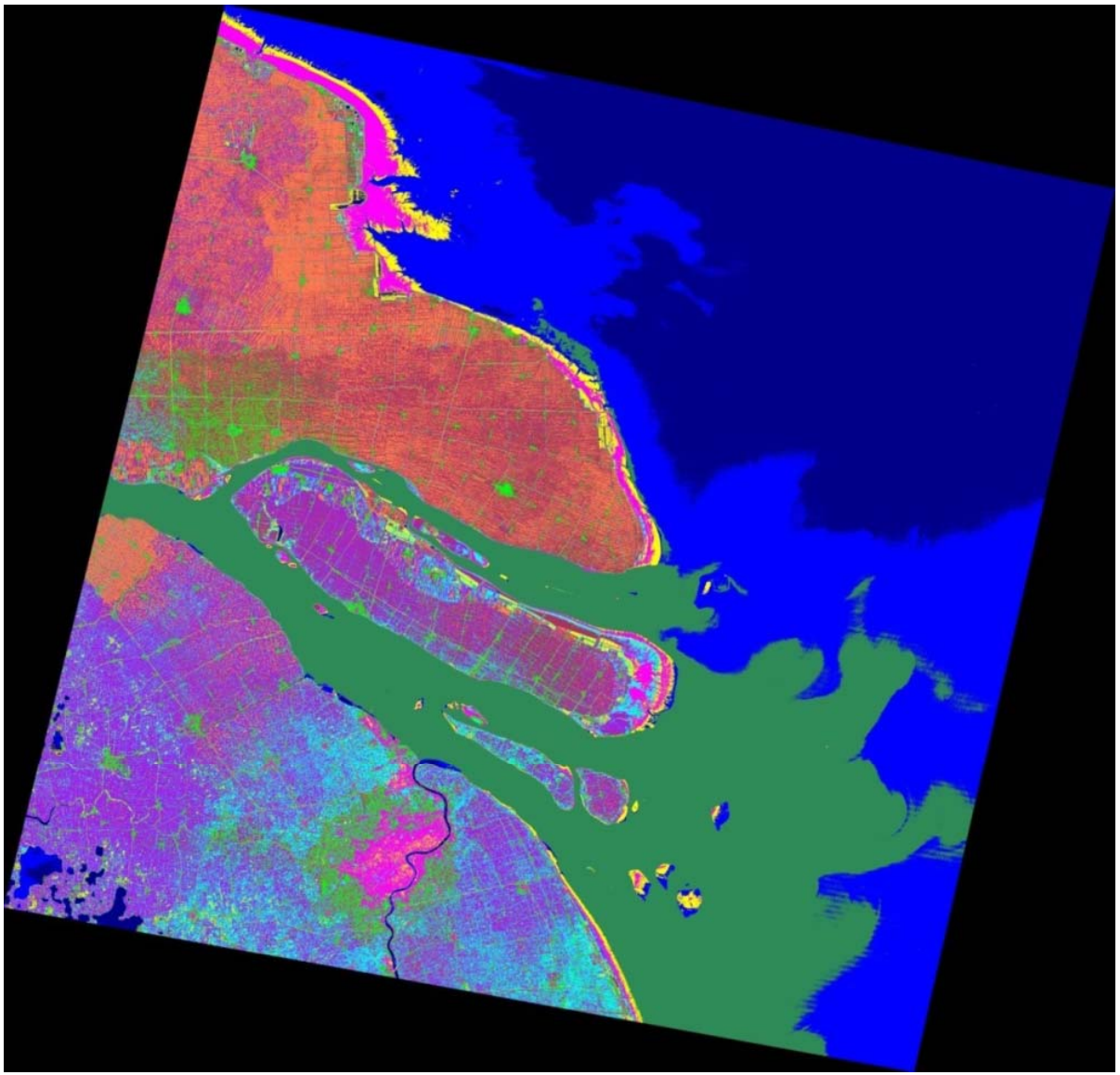
Color infrared composite

Identification

Remark : identification = most representative land cover type found within the class.
Misclassified pixels within each class.

Class Number	Class color	Area %	Identification
1	Blue 3	13.199	Water
2	Blue 2	13.693	Water
3	Seamarine	14.715	Water
4	Yellow	3.502	Inter Tidal + Urban Land
5	Cyan	4.811	Agricultural Land : Irrigated Paddy Field
6	Purple	4.815	Several land cover types
7	Maroon	4.709	Several land cover types
8	Green	1.728	Urban Land : High Density
9	Magenta	3.917	Urban Land : Medium Density
10	Coral	5.787	Agricultural Land : Dry Farmland

08/11/1989 Unsupervised classified image



Problem : No valuable ground surface data

Spectral patterns

Color infrared composite

Identification

Class Number	Class color	Area %	Identification
1	Blue 3	15.319	Water
2	Blue 2	12.367	Water
3	Seamarine	13.523	Water
4	Yellow	1.495	Inter Tidal
5	Cyan	3.898	Several land cover types
6	Purple	7.775	Agricultural Land : Irrigated Paddy Field
7	Maroon	6.738	Several land cover types
8	Green	2.54	Urban Land : High Density
9	Magenta	2.016	Urban Land : Medium Density + Inter Tidal
10	Coral	5.205	Agricultural Land : Dry Farmland

Supervised classification

Principle : - The analyst defines the classes and their numerical descriptors.

- The software labels each pixel with the class it belongs to.

Maximum Likelihood Classifier

Choice of classes

USGS « LU/ LC Classification System for Use with Remotely Sensed Data »

Landsat images → **Level I** Classification

1) Urban or Built-up Land 2) Agricultural Land 3) Rangeland 4)Forest Land

5) Water 6) Wetland 7)Barren Land 8)Tundra 9)Perennial Snow or Ice

Applied to our area → Urban Land, Agricultural Land, Rangeland ,Forest Land, Water and Barren Land.

Unsupervised classification : - Inter Tidal as a class

- No classes for Range, Forest and Barren Lands → Problem to classify

Training samples

For each class, Training samples = representative set of sites.
Compile a numerical interpretation key, that describe the spectral pattern of the class.

Class	Image	Samples
Urban Land	Color infrared composite	Bright blue, mixed zone
Agricultural Land	Unsupervised classified image	At least the 2 agricultural classes
Range Land	Visible	Known golf and garden
Forest Land	Visible	Known parks and forests
Water	Unsupervised classified image	At least the 4 water classes
Barren Land	Color infrared composite	Yellow
Inter Tidal	Unsupervised classified image	Yellow

Future work

The coming week

- Training samples
- Maximum likelihood classification

Later

- Accuracy assesment
- Urbanization rate

- 2nd part of the project : Albedo calculation

Thank you!