

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

## CLASSIFICATION

07/20/2011

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# From the last meeting

2007 image was gap-filled → Problem for the albedo calculation

→ New image

Author	NASA Landsat Program	NASA Landsat program
Publication Date	21/10/2008	22/02/2008
Collection Name	<b>Landsat 5 TM scene</b>	<b>Landsat 7 ETM+ scene SLC-On</b>
Image Name	ID 201-985	ID 210-284
Processing Level	Ortho, GLS 1990	Ortho, GLS 2000
Publisher	USGS	USGS
Publisher Location	Sioux Falls	Sioux Falls
Product Coverage Date	<b>08/11/1989</b>	<b>07/03/2001</b>



Mouth of the Yangtze River Delta  
07/03/2001

Source : [www.landcover.org](http://www.landcover.org)

# Image preprocessing

Same as before.

- **Pictures cut**

Pictures of different sizes

- **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% *ENVY Software*

# Unsupervised classification

Previous classification : most classes attributed to water

→ Apply a mask on water

→ Unsupervised classification of the land

*ISODATA*

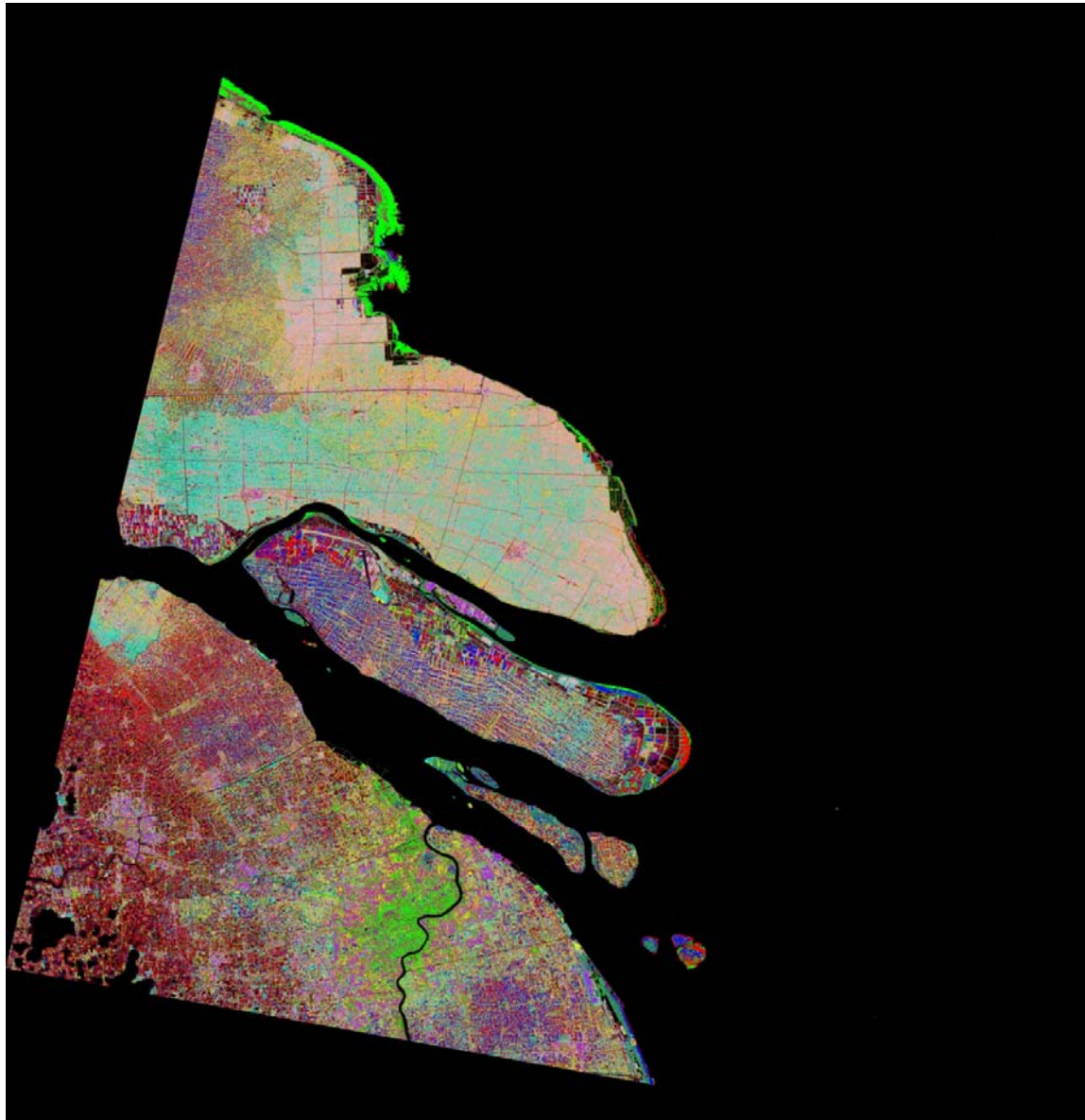
**Chosen parameters :**

Number of classes : between 5 and 10

Number of iterations : 15

Change threshold : 5

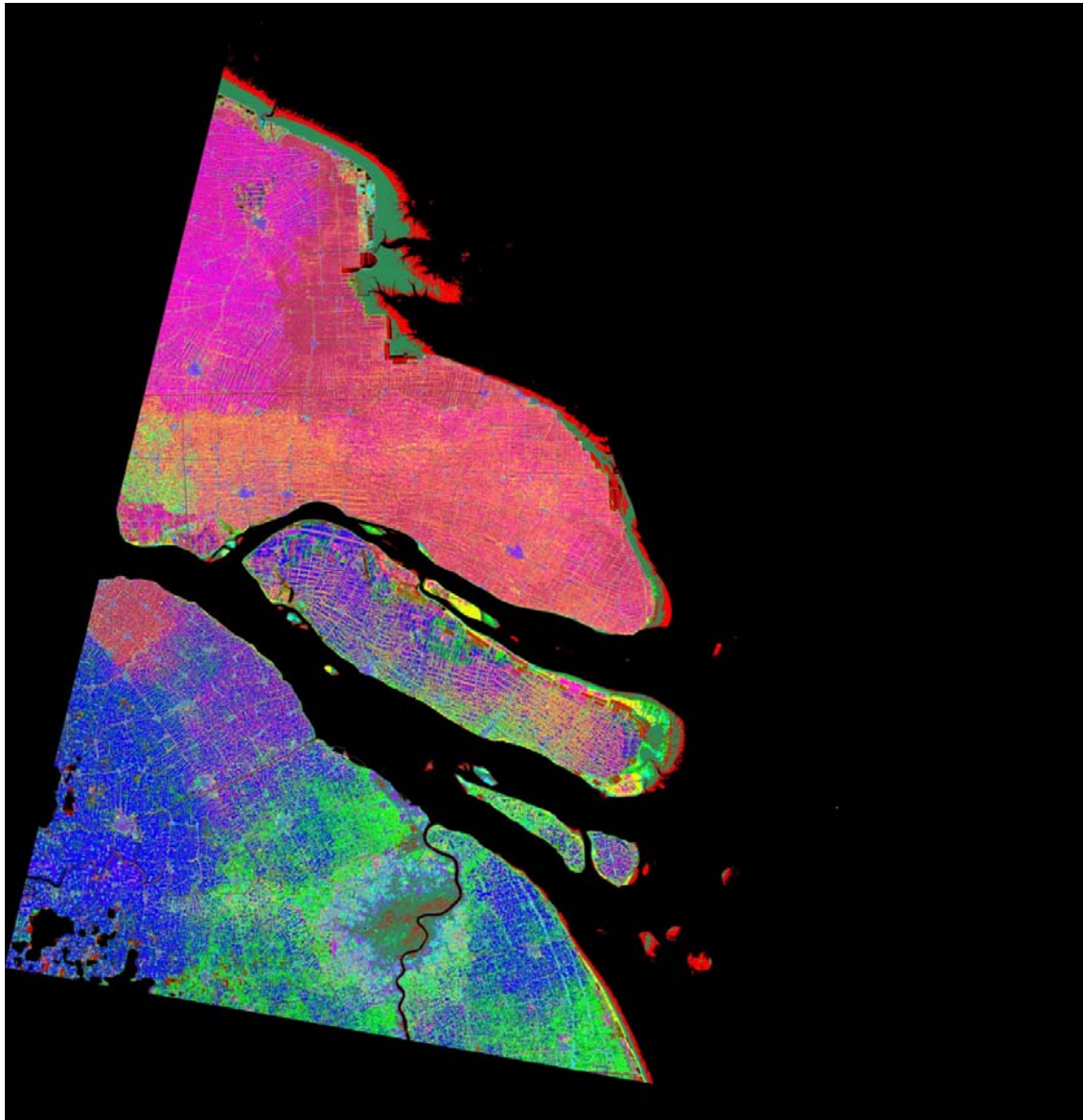
# 07/03/2001 Unsupervised classified image



# Identification

Class number	Class color	Identification
1	Red	Water      Dark pixels in visible (fields, quarries)
2	Green	Intertidal      Urban Land
3	Blue	Vegetation (parks, fields)
4	Yellow	Urban Land
5	Cyan	Agricultural Land
6	Magenta	Urban Land      Agricultural Land
7	Maroon	Urban Land
8	Seamarine	Urban Land (Bright pixels in color infrared composite)
9	Purple	Forest Land
10	Coral	Vegetation (parks, fields)

08/11/1989 Unsupervised classified image





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4	Yellow	Canals Agricultural Land
5	Cyan	Urban Land
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10	Coral	Agricultural Land Urban Land

# Choice of classes

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

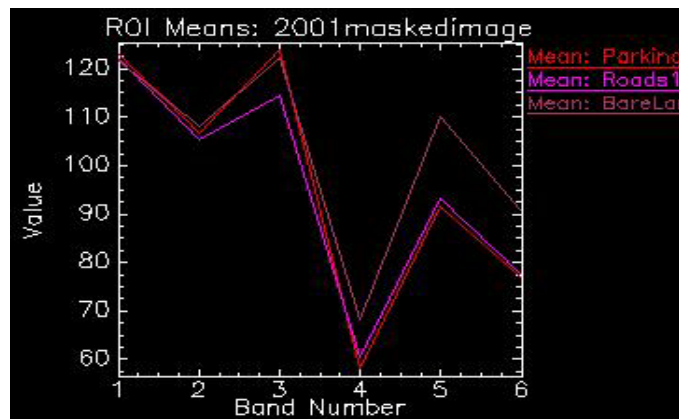
Level I : Urban Land, Agricultural Land, Range Land ,Forest Land, Water and Barren Land

From the unsupervised classification :

- 2 classes for urban: Urban Land LA and Urban Land HA

From the spectral patterns :

No class for Barren Land



Spectral separability between Barren Land and Highways :

Jeffries-Matusita :  $1.07993221 < 1.9$

Transformed Divergence :  $1.35410740 < 1.9$

# Seven classes

<b>Class name</b>	<b>Definition</b>
<b>Urban Land HA</b>	Blue and white roofs; Bright quarries
<b>Urban Land LA</b>	Red, brown and grey roofs; Parkings; Highways; Railways; Dark quarries
<b>Agricultural Land</b>	Croplands; Pastures
<b>Range Land</b>	Grass
<b>Forest Land</b>	Trees
<b>Water</b>	Ocean; Rivers; Lakes; Reservoirs; Aquaculture pounds
<b>Intertidal</b>	In between the land and the sea

**Caution** : Intertidal and RangeLand spectrally similar to other classes

# Supervised classification (2001)

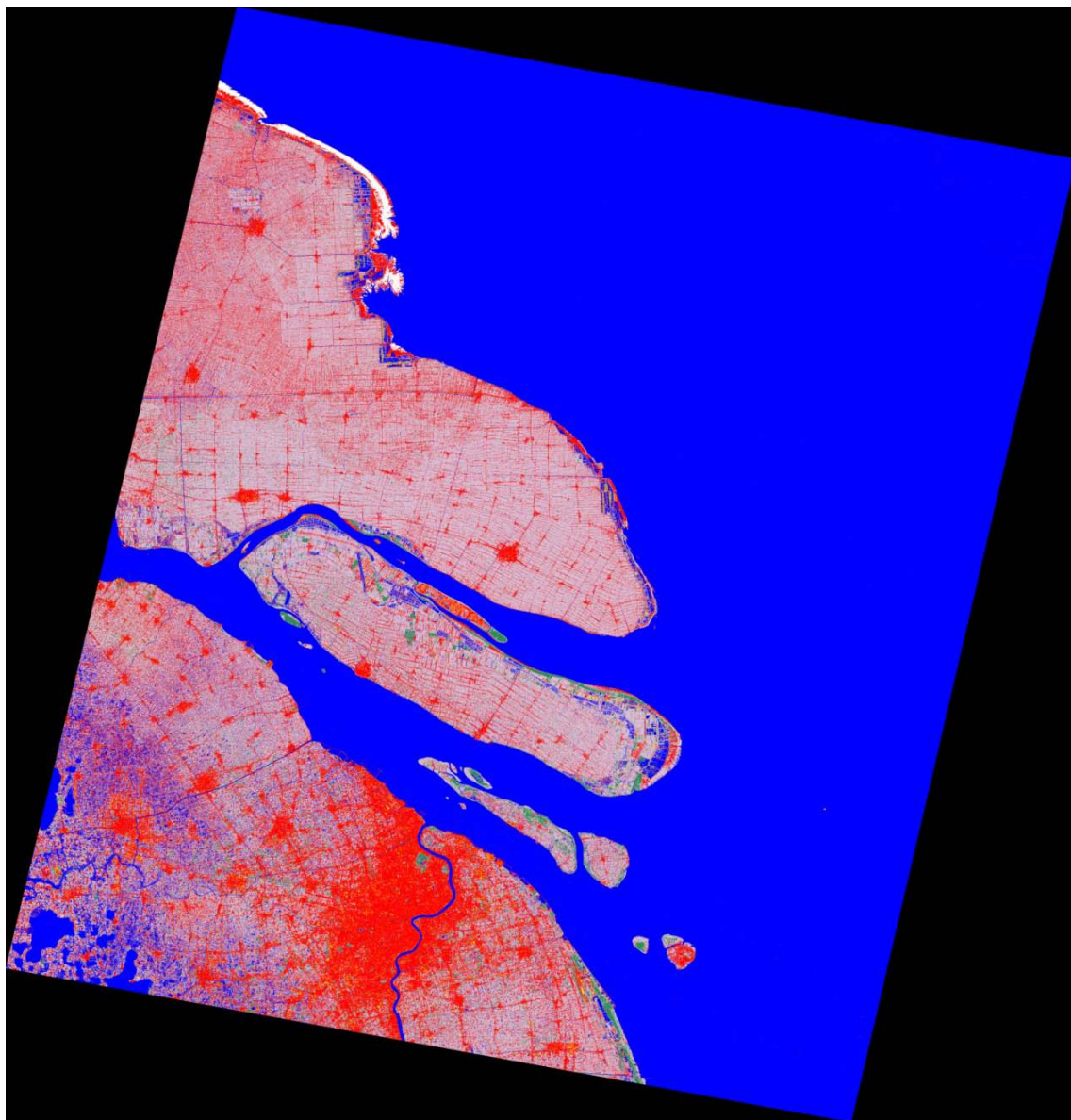
## Method :

- Define several ROIS for each class
- Run the classification with all the ROIS.

*Maximum likelihood algorithm*

- Combine the classes

# 07/03/2001 Supervised classified image



## Legend

- Urban LA
- Urban HA
- Agricultural Land
- Range Land
- Forest Land
- Water
- Intertidal

# Problem

**Problem 1** : Fuzzy.

But reflects the reality. Each urban pixel in a field is partly made of a urban element.

The aim of the project is to find out if having a urban surface instead of a non urban one changes the albedo.

→Keep it fuzzy.

**Problem 2** : Mixed pixels of canals and fields classified as Agricultural Land.

# Class Statistics

Class	Nb of pixels	Area %
Urban HA	169,927	0.61
Urban LA	3,350,412	11.94
Agricultural Land	6,764,447	24.10
Range Land	62,887	0.22
Forest Land	391,578	1.39
Water	17,248,470	61.44
Intertidal	83,730	0.30
Total	28,071,451	100

Land Class	Land Area %
Urban HA	1.57
Urban LA	30.96
Agricultural Land	62.5
Range Land	0.58
Forest Land	3.62
Intertidal	0.77
Total	100

Land = 1/3 Urban  
2/3 Agricultural

# Accuracy assessment

Ground truth data : **Google Earth**

Location : Subset of Shanghai

Dates : 11/21/2000 and 07/23/2002



Google Earth 11/21/2000

At least 40 GCPs per class

*Hypothesis :*

*If a pixel has the same land cover in 2000 and 2002*

*→ Same land cover in 2001*



# Results

**Overall accuracy** = Number of correctly classified pixels / total number of reference pixels

Overall accuracy = 90.4018%

## **Kappa coefficient**

Represents the probable better accuracy of the employed maximum likelihood classification than if the classification resulted from a random assignment instead.

Kappa coefficient = 0.8090



Class	Urban LA	Urban HA	Agri	Range	Forest	Water	Intertidal
<b>Producer Acc.</b>	96.94	100	71.43	7.32	85	97.92	80
<b>User Acc.</b>	96.78	85.07	49.30	75	64.15	100	100

**User accuracy** = Nb of correctly classified pixel in the category / total nb of pixels classified in that category

Indicates the probability that a pixel classified into a given category actually represents that category on the ground.

Good for urban classes.

Not so much for vegetation classes but misclassification in other vegetation classes

# Supervised classification (1989)

Same method but new ROIS

Pb : no ground truth data

- Water ROIS from the unsupervised classification
- Other ROIS : Take previous ROI

Check if the spectral pattern correspond

# Future work

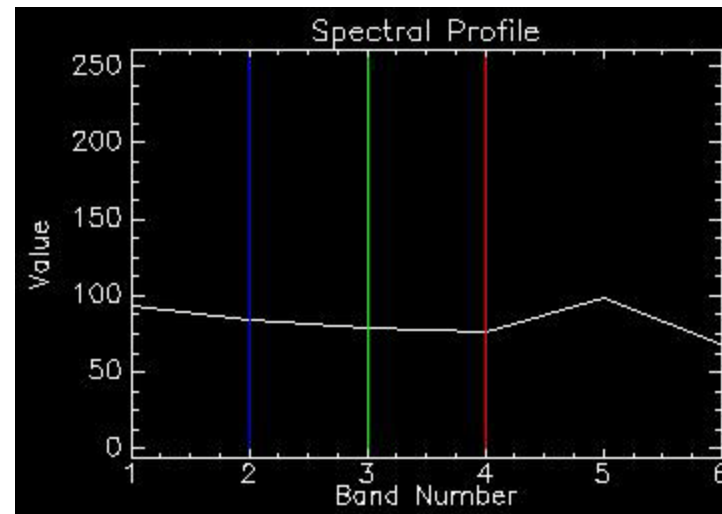
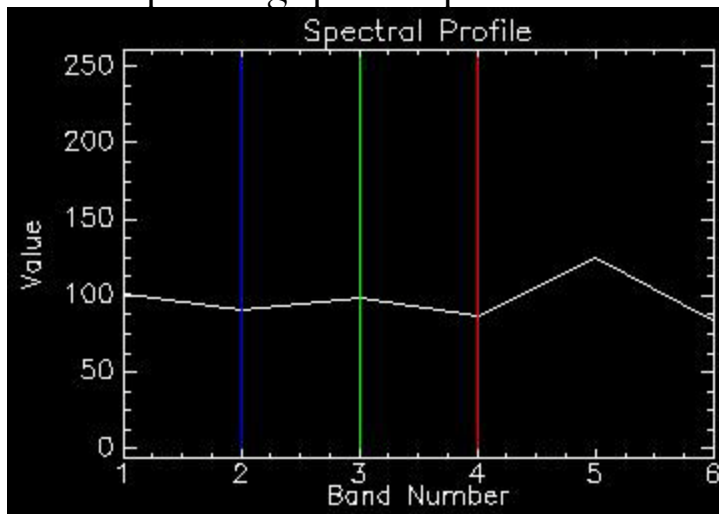
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- Finish the 1989 image classification
- Land cover change

## Highlight the classification problems to solve

- Too many HA pixels misclassified as LA -> Change the ROIS repartition into the class
- Agricultural Land misclassified as Urban Land LA

Corresponding spectral pattern :



New Agricultural Land ROIS with these 2 kinds of spectral pattern