

2. Satellite Imagery Analysis

2.1 Land Use

The raw imagery data was taken on December 25, 1999. The original Landsat TM image and the land cover image produced are shown in Figures 2.1.1 and 2.1.2.

Figure 2.1.1 is the output in Lambert projection with a resolution of 50 m, after applying geometrical correction using ‘affine’ transformation, level correction, and contrast stretch.

Figure 2.1.2 shows an analyzed land cover image based on ground usage obtained from a field survey. The image is classified into 8 categories: (1) Mud land, (2) Fish pond and Paddy field, (3) Field, (4) Grass, (5) Wood land, (6) Residential and Bare land, (7) Industrial and construction area, and (8) Water.

As a method of classification, an unsupervised classification (based on the ISODATA method with 40 clusters) was applied. The ISODATA method procedure is shown in Figure 2.1.3. This method is one of the high degrees of classification in which the first-stage temporal-initial clusters are set and the members among these clusters are re-classified through an iteration process.

The clustering process is repeated until either the number of iterations reaches the maximum or until the number of pixels, which are not classified into different clusters, reaches the threshold value during the iteration. The necessary parameters to be processed are as follows: (1) Number of clusters, (2) Input of initial clusters, (3) Threshold values of convergence, (4) The maximum times of iteration.

All of these time bands (bands 1-5 and 7), except the thermal infrared band (band 6) were used for the analysis. Although 40 classes were produced through unsupervised classification, it is not clear what each class means. Thus, referring to the results of the field survey, these classes were combined into several classes that corresponded to real land covers. In this way, the land cover image with eight categories was obtained.

The coastal area is highly developed and the land is used for residential and industrial purposes as well as for fishponds and paddy-fields. Dongguan and Shenzhen, in the east, are the most developed areas in the region, and have very little grassland. In north area is Guangzhou, which has some paddy-fields and grasslands. In the west area, there is a mostly developed land and some grass-woody land.

The area of direct runoff into basin without passing through the major four outlets (Humen, Jiaomen, Hongqimen and Hengmen) was calculated as in Table 2.1.1, based on the land use map shown in Figure 2.1.2.

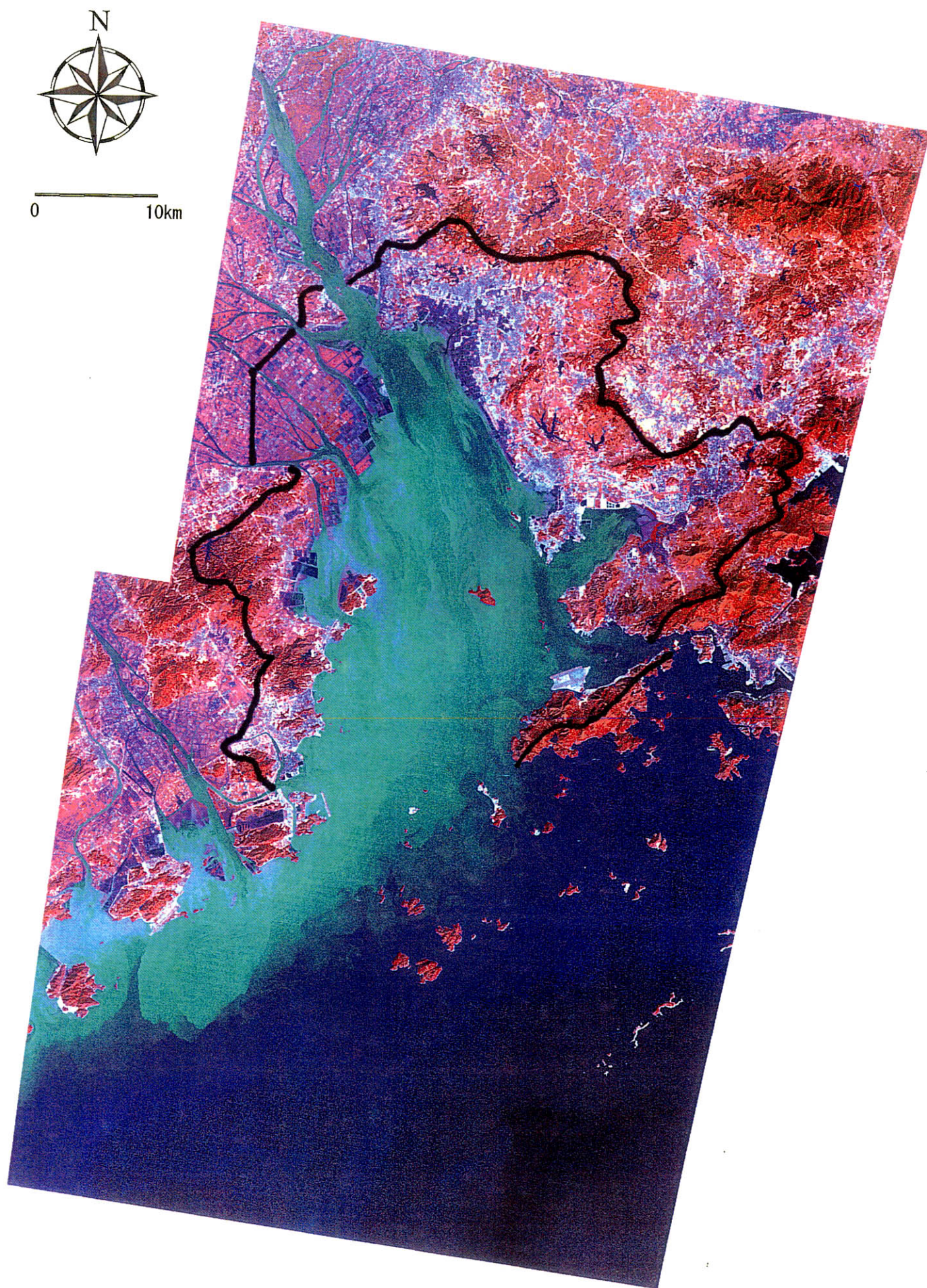


Figure 2.1.1 Landsat TM Image (RGB:4,3,2)
Date : 1999/12/25

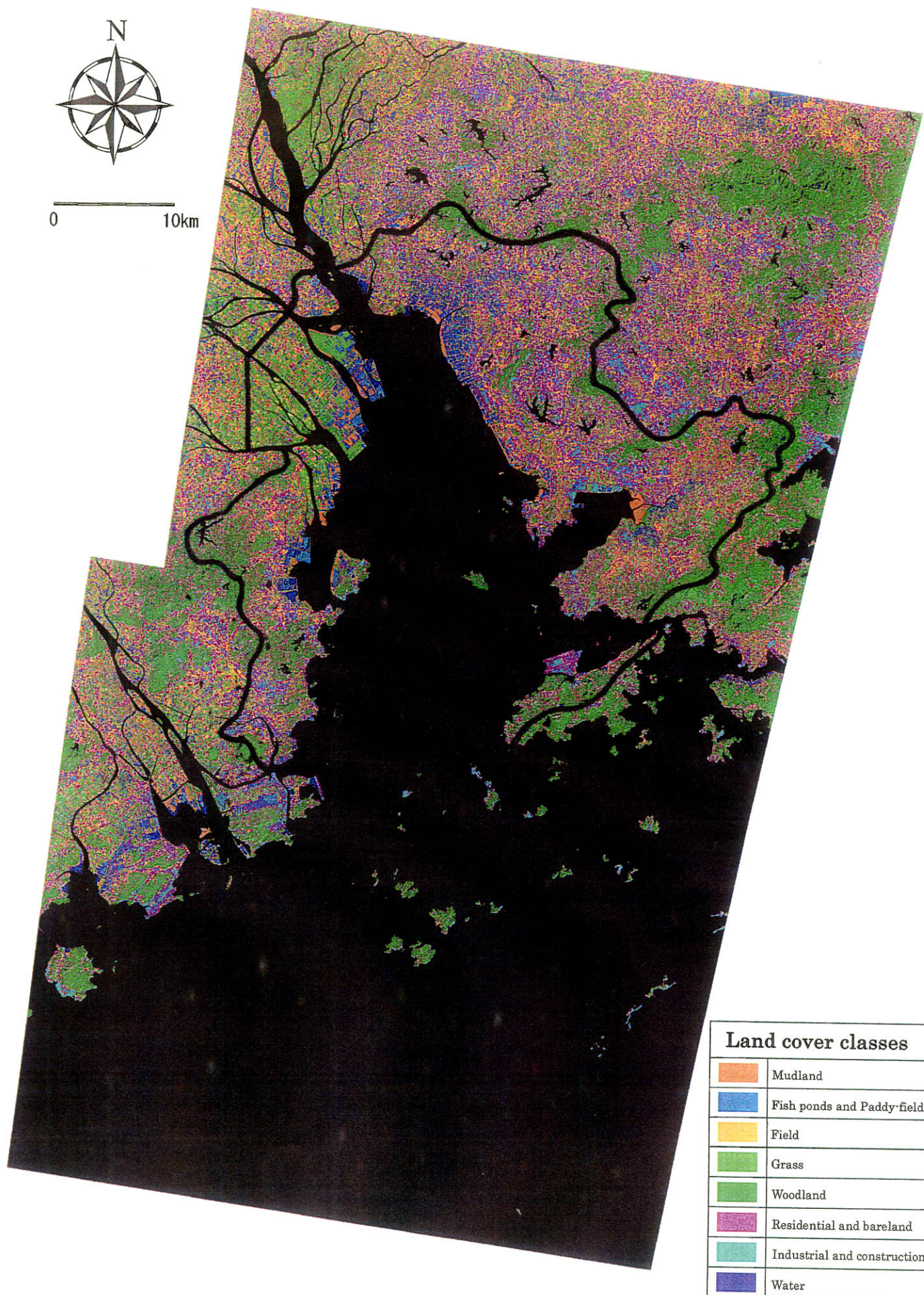


Figure 2.1.2 The Land Cover Image
Date : 1999/12/25

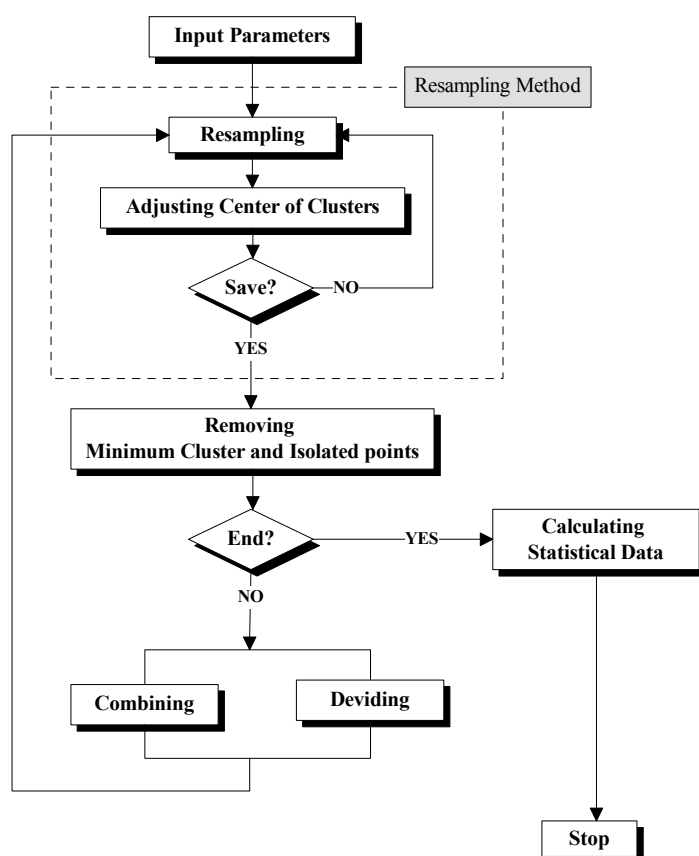


Figure 2.1.3 Image of ISODATA method

Source: Extracts from "Illustrated Remote Sensing by Remote Sensing Association of Japan"

Table 2.1.1 Land Use of the Direct Runoff Basin (km²)

Tide land & Mud land	297.13
Nursery farm & Paddy field	139.78
Agricultural land	225.26
Grass land	216.67
Wood land	522.52
City area	710.67
Industrial area	109.32
Water area	0.00
Total	2,221.34