PART II PARTICULARS

CHAPTER 1 ANALYSIS OF SATELLITE IMAGE

1-1 Methods for Analysis

The satellite image analysis was aimed to obtain the basic geological data by means of satellite image interpretation including of geological units, lineament analysis and extraction of spectral anomaly zone indicating mineralized alteration.

Image data for the survey are the LANDSAT TM data of Path 153 - Row 31.

The area of the scene and color composite image are shown in Fig. II-1-1.

The data analysis has been done in the following procedure.

1) Preparation of color composite image

Coefficients of correlation between bands were calculated and discussed. As the result, it was concluded that the image, for which blue, green and red colors are assigned respectively for Band 1, 4 and 5, best reflects topographic information and reproduces with higher fidelity changes in the tint corresponding to difference in lithofacies.

2) Preparation of ration image (extraction of alteration zones)

Ratio image was produced in compliance with the following procedures.

a. Elimination of snow and glacier coverage (Band 1=255)
b. Conversion to apparent reflectance (logarithmic residuals method):
c. Calculation of NDVI: NDVI (Normalized Differential Vegetation Index) is calculated in the following formula:
d. Ratioing-1: Since many of clay minerals and carbonate minerals have absorption characteristics to Band 7 of TM, areas where these minerals occur can be extracted by ratioing in the formula of (Band 5-Band 7)÷(Band 5+Band 7).
e. Directed principal component analysis (DCPA): Since vegetation coverage have absorption characteristics to Band 7, principle component analysis by NDVI and Ratioing-1 was made in order to distinguish anomaly of vegetation and/or alteration. In the area of dominant vegetation like this area, it is considered that the first principle component shows quantities of vegetation and the second principle component shows quantities of alteration.
f. Ratioing-2 : To extract iron oxide zones, ratioing was made in the formula of (Band 2-Band 1)÷(Band 2+Band 1).
g. Level slice : Of the second principle component of NCPA and ratioing-2, respectively, spectral anomaly areas were extracted from the maximum value, at the thresholds of 1% and 5%. Results of the analysis, composed with the Band 5

monochrome image, were output. The image produced is exhibited in Fig. II-1-2.

3) Geologic Interpretation

Based on the 1:200,000 color composite image, Division into geologic units and Lineament extraction was conducted by means of photogeologic analysis

4) Elaboration of a lineament density distribution map

The total extension of lineaments per unit area was obtained from the mentioned lineament map, from which lattice data were produced and, in turn, a lineament density distribution map was drawn.

5) Extraction of spectral anomaly zones

In the ratio image areas, in which pixels of showing a maximum figure to 1 % of (Band 2-Band 1)/ (Band 2+Band 1) are distributed with having a spread area, are extracted as anomaly zone.

1-2 Results of analysis

1-2-1 Lineament analysis

Results of lineaments interpretation are shown in Fig. II -1-3. Trends in distribution of lineaments extracted from the area for analysis may be summarized as follows:

a. Numerous lineaments in parallel to a main drainage system are extracted.
b. Half-circular structure in approximate 10 km radius develops in Paleozoic formation of eastern part in this area.
c. Kichi-Sandyk deposit is located on the lineament extending to NNE-SSW direction intermittently. In particular, this area has a heavy concentration of lineaments.

1-2-2 Division into geologic units

The geologic interpretation map drawn from the color composite image is exhibited Fig. II-1-4. The area for analysis was segmented into 7 units.

1-2-3 Spectral analysis

As the result of spectral analysis to extract the alteration zone, it has become clear as follows:

a. Argillic alteration and carbonatization : as a result of DCPA analysis, no spectral anomaly area with possibility of alteration exists in this survey area.

b. Oxidized iron zone: The distribution of spectral anomalies suggesting the exist of oxidized iron zone tends to be as follows:

- The distribution tends to concentrate around existing ore deposits like Kichi-Sandyk
- It extends along intermittent lineaments in NNW-SSE direction.
- It occupies surrounding unit D in the northeast part of this area.
- It scatters in Paleozoic formation P2, showing a clear bedding and diverse of rock facies

1-2-4 Comments

An integrated interpretation map is exhibited in Fig. II-1-5.

As a result of this analysis, lineament density and the distribution of spectral anomaly may be controlled by the distribution of intrusive. The area which has more than 3000 (m/km2) of lineament density are extracted as promising area for mineral exploration, because there might be has high possibility of the existing of mineralization in the high density zone of lineament.

Kichi-Sandyk deposit is included in the above mentioned promising area and spectral anomalies are scattered in the surroundings.

Furthermore, given the fact that it lies in the south end of the above promising area in the extension of the NNW-SSE lineament and that spectral anomaly was detected around it, coupled with the mineralization on surface, mineral showings in Turpac-Tushty too are promising for mineral exploration.

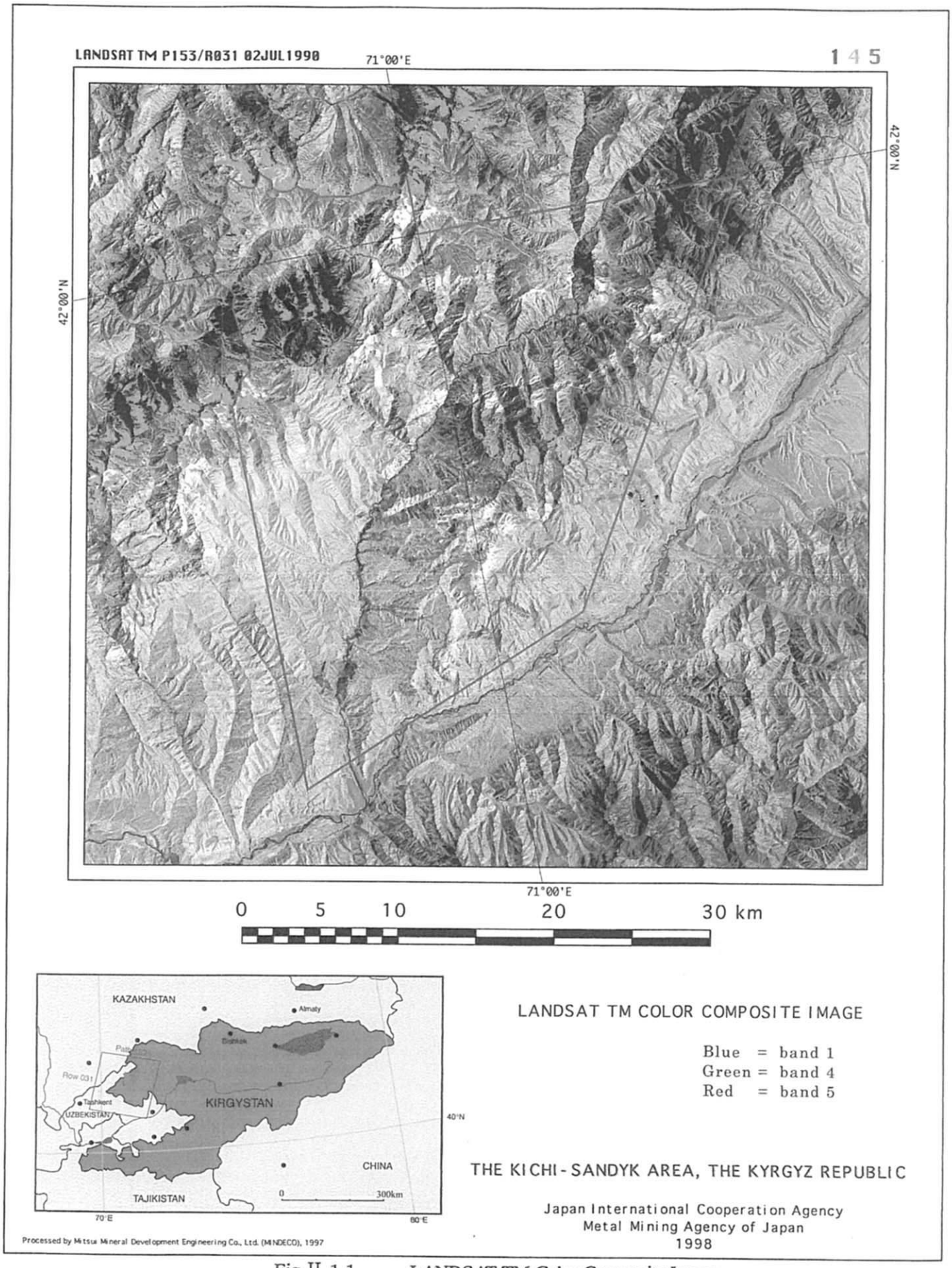


Fig. II-1-1 LANDSAT TM Color Composite Image

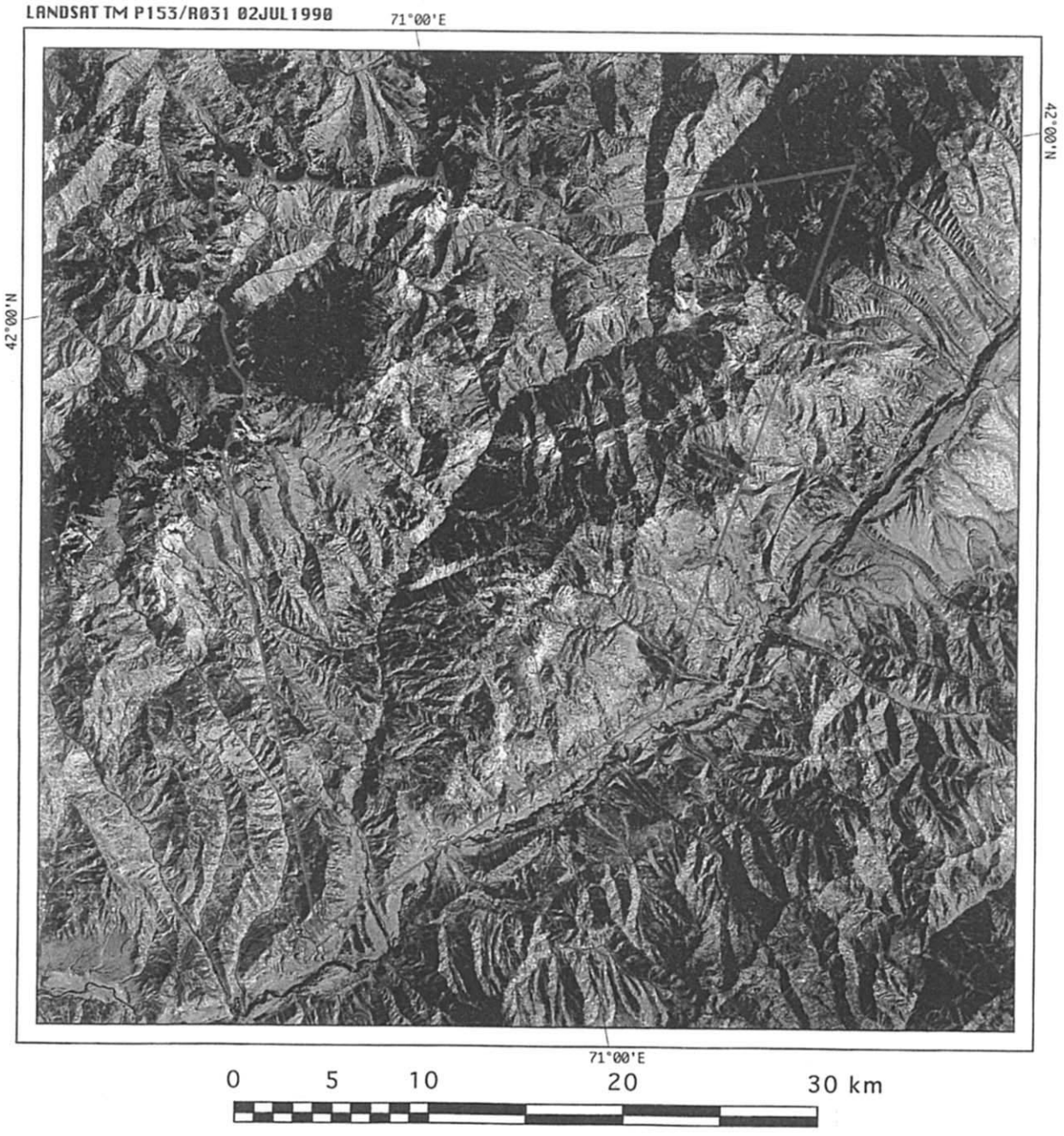
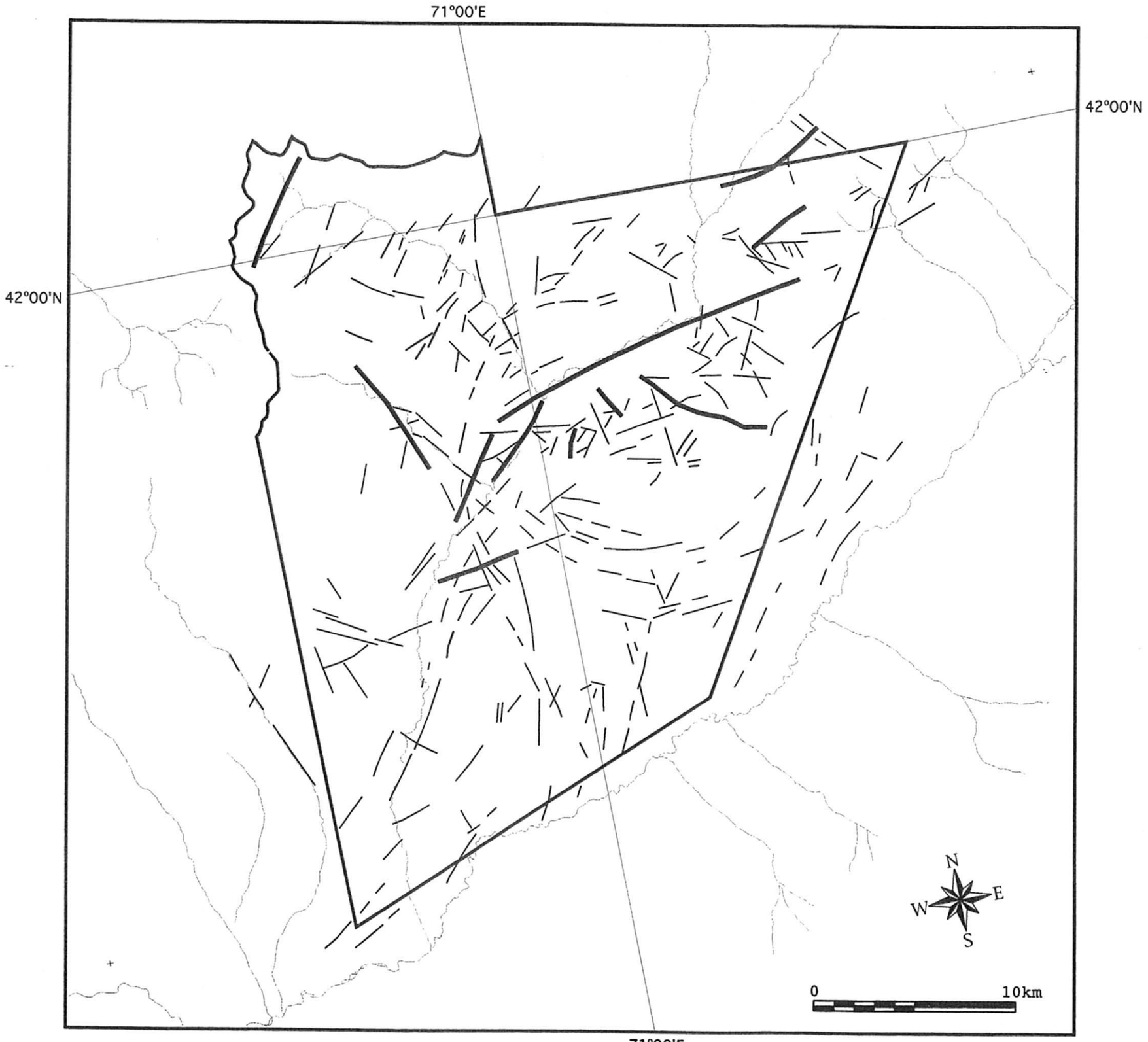


Fig. II-1-2 LANDSAT TM Ratio Image

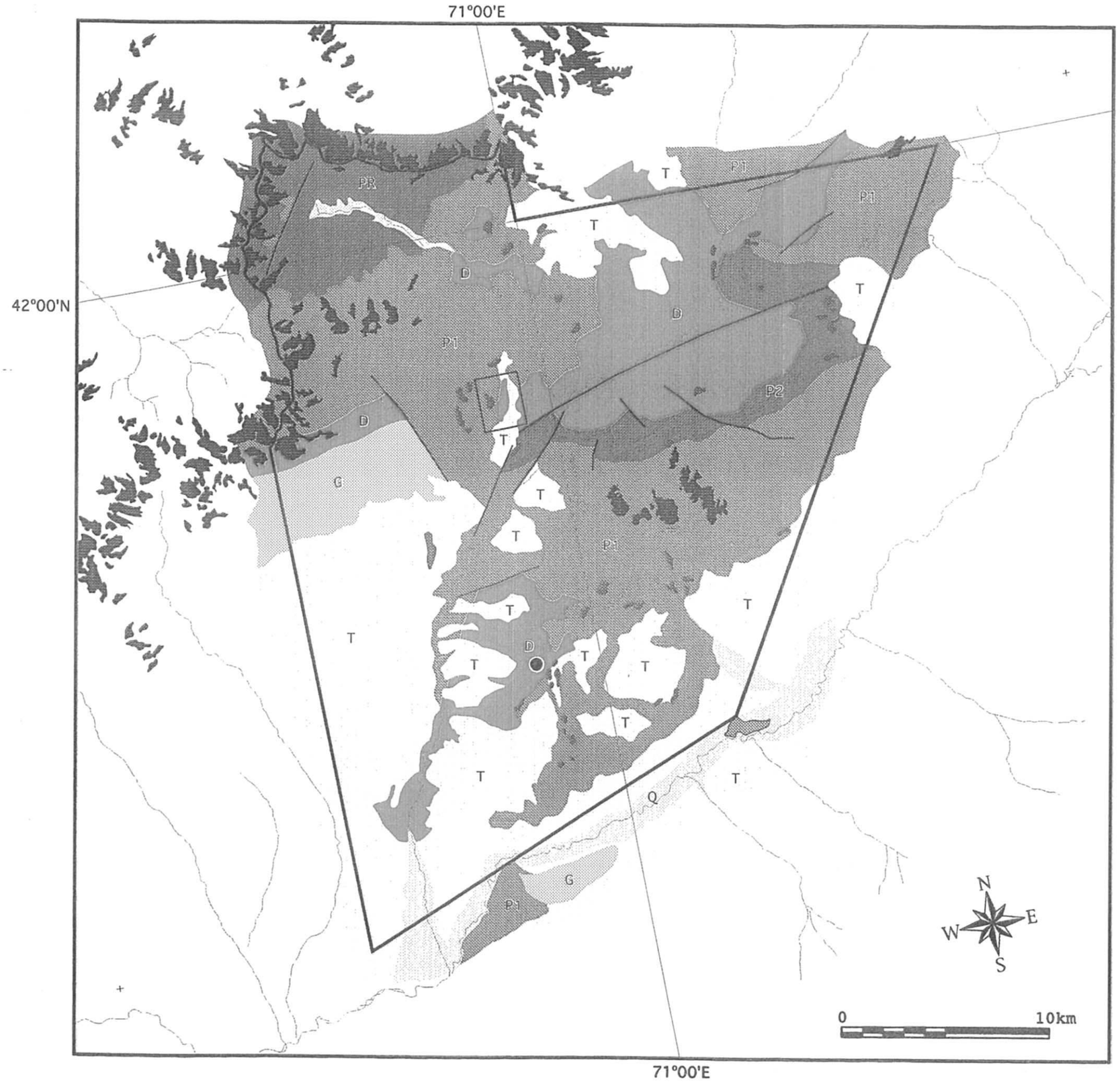


Fault

Lineament

Drainage

Fig. II-1-3 Lineament Extraction Map



Sedimentary Units

- Q — Alluvial deposit
- T — Cenozoic molasse
- P1 — Paleozoic 1
- P2 — Paleozoic 2
- PR — Proterozoic

Intrusive Rocks

- G — Granite
- D — Diorite

Others

- Spectral anomaly
- Fault
- Bedding trace
- Glacier
- Town
- Drainage
- The Survey area for Detailed Geological Survey
- Turpak-Tushty ore field

Fig. II-1-4 Geologic Interpretation Map of LANDSAT TM Image

Fig. II-1-5 Integrated Interpretation of Image Analysis