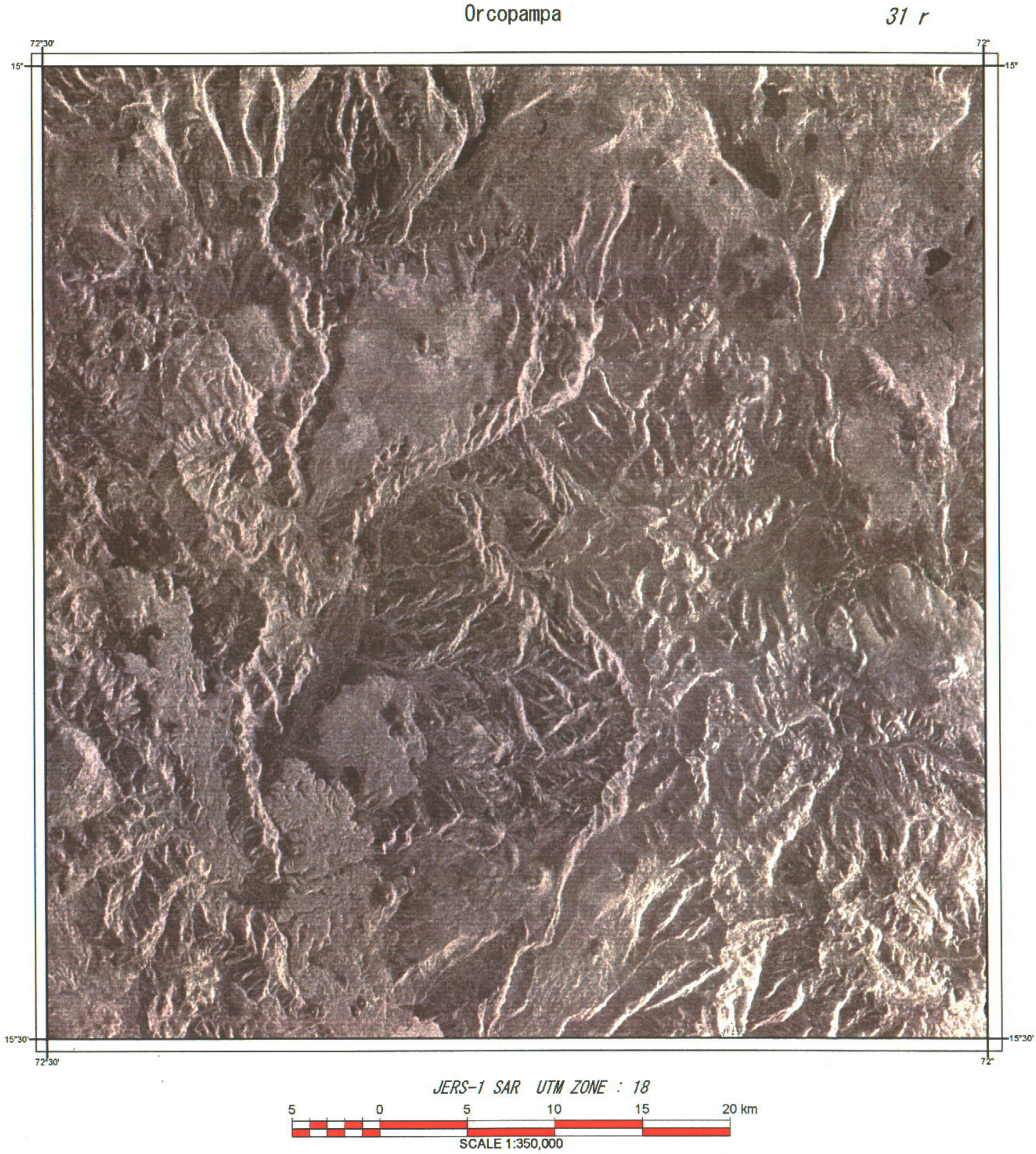

Fig.10-1 Orcopampa quadrangle (31-r) JERS-1 SAR image

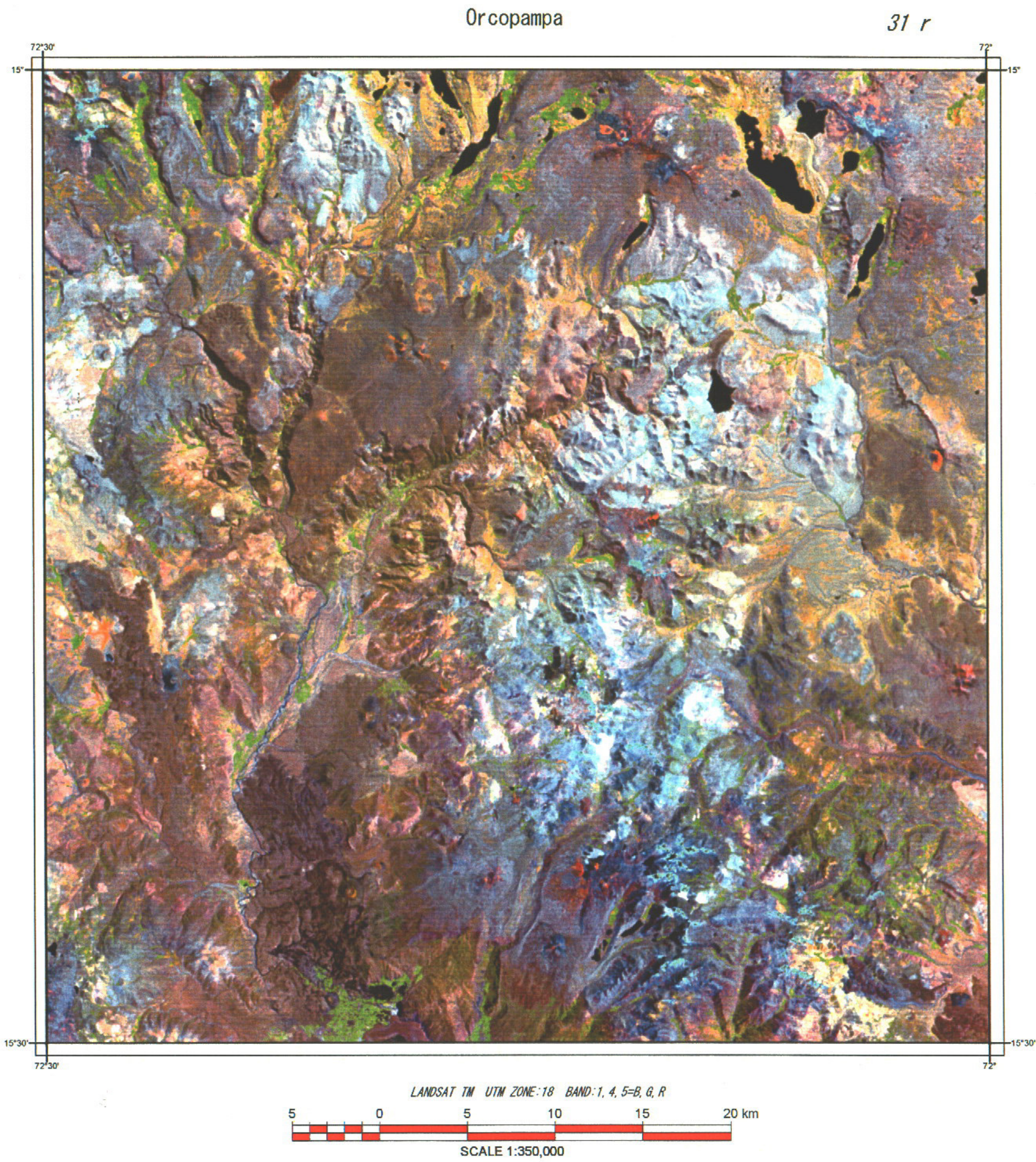

Fig.10-2 Orcopampa quadrangle (31-r) LANDSAT TM image

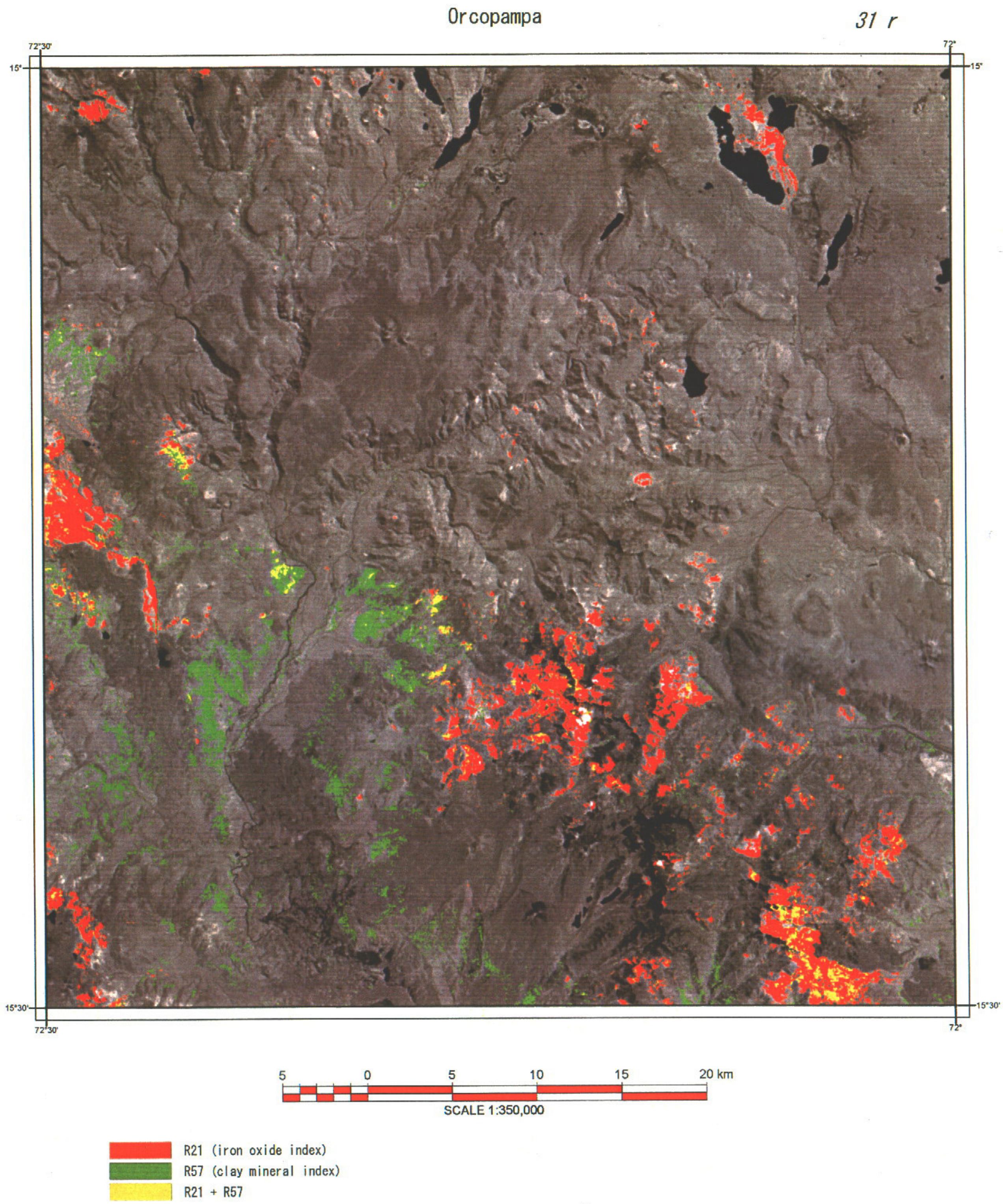

Fig. 10-3 Orcopampa quadrangle (31-r) LANDSAT TM ratio anomaly map

Orcopampa

31 r

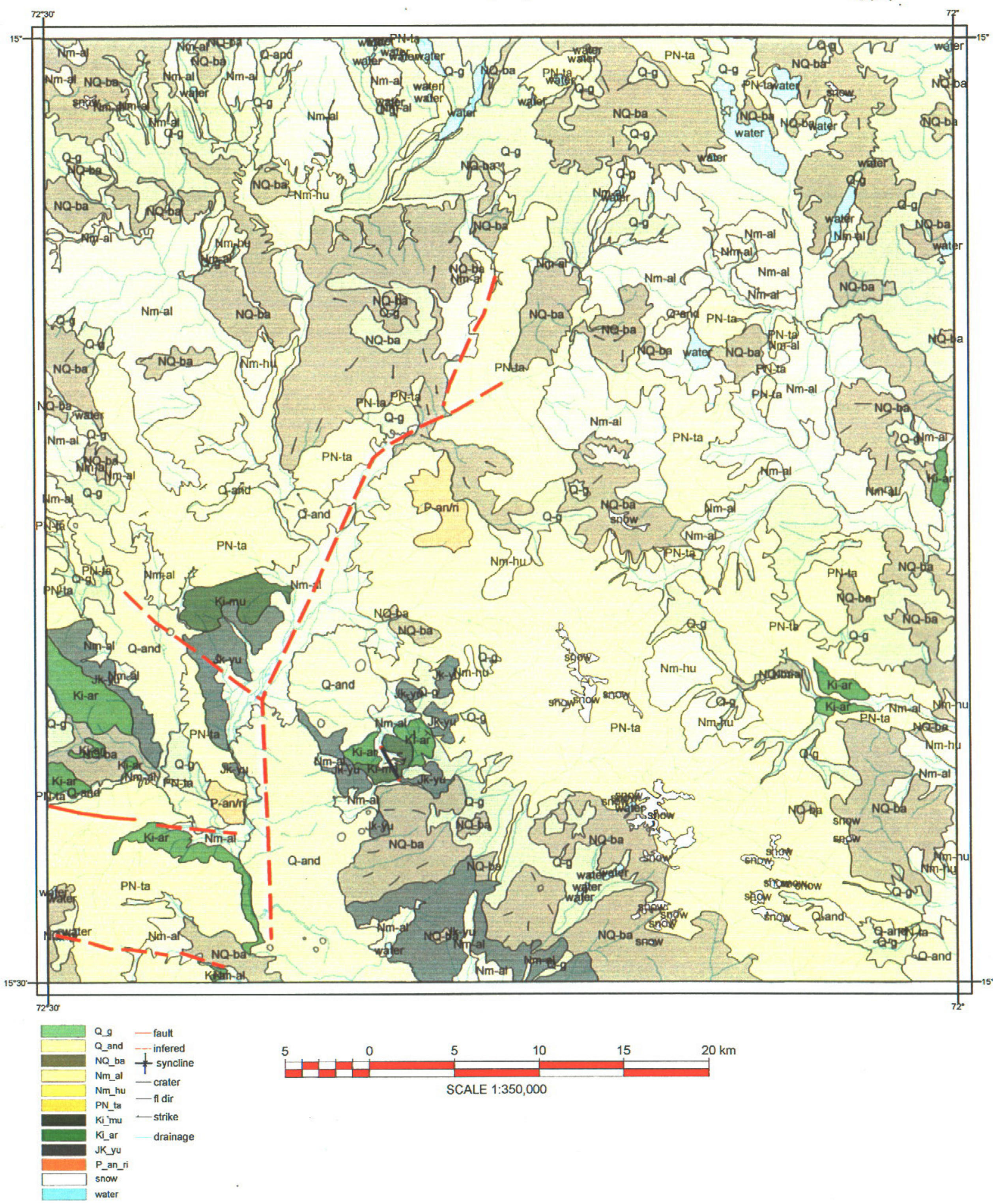

Fig.10-4 Orcopampa quadrangle (31-r) Geologic interpretation map

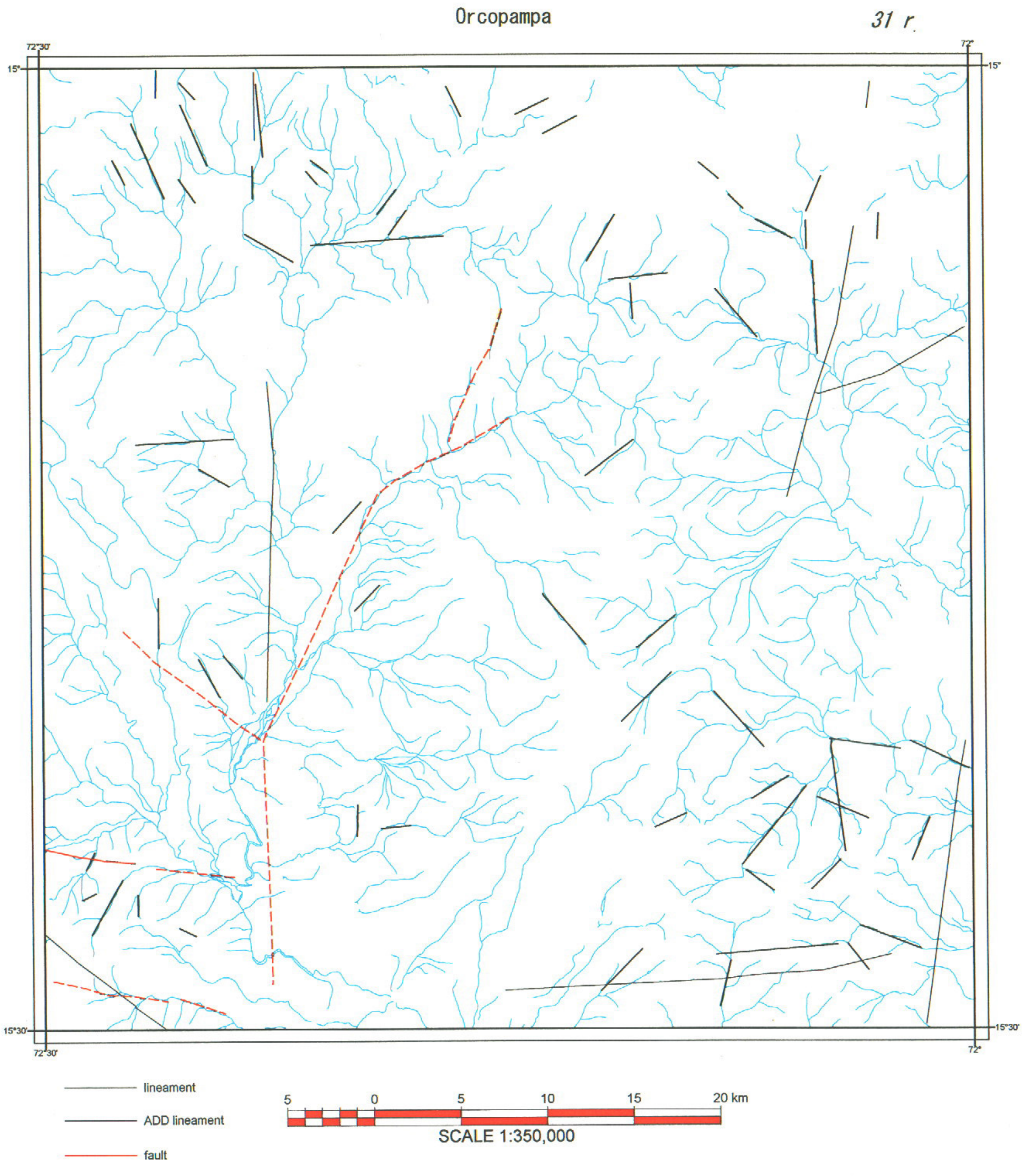

Fig.10-5 Orcopampa quadrangle (31-r) Lineament map

In order to clarify differences in the lineament density by areas and also in the lineament direction by geologic units with the aid of the GIS data set prepared on the basis of the interpretation results, the lineament density analysis and the lineament direction analyses were made. The analysis methods are described in the following paragraphs.

1. Analysis of Lineament density

1) The lineament data prepared of the respective quadrangles were integrated into the MOSS (Map Overlay and Statistical System) format file, one of the GIS standard format by the USGS.
2) By obtaining a cumulative extension of all faults and lineaments included in a 5km x 5km grid, the lineament density (m/km2) of the grid were calculated, which was standardized with the assumed maximum value of 1. For computation of the density, an analysis tool developed by MINDECO was employed.
3) The computation results output in the CSV format was converted to vector point data of the TNTimps .rvc file.
4) From the vector, the TIN (Triangular Irregular Network) data were prepared.
5) A 3-dimentional model optimum for the TIN was prepared, which was output as 16-bit raster data.
6) From the raster data, contour maps of lineament density were drawn, and statistical values were calculated from the original CVS format data. Lineament density anomaly areas were extracted where density values are higher than '2 σ' (=Mean + 2 × Standard Deviation).

2. Analysis of Lineament direction

1) Lineaments included in a same geologic unit were extracted from the geologic interpretation maps overlaid with the lineament maps, to prepare lineament maps of the respective geologic unit.
2) Rose diagrams (RD) were prepared from the directional data of each lineament, for which the Directional Analysis of the TNTmips was employed.
3) Similarly, rose diagrams were prepared of lineaments of the respective quadrangles.
4) In order to clarify the directional tendencies of lineaments by geologic times, lineaments were extracted from areas where Ordovician to Permian, Jurassic to Cretaceous and Paleogene to Quaternary rocks are respectively distributed.
5) RDs of the respective quadrangles were prepared in the same manner as the RD of lineaments in the entire area.

1-4-2 Results of Analysis

(1) Analysis of lineament density (Fig. 11)

In regard to lineament density of the whole survey area, density of lineaments of NW-SE, E-W direction and some of NE-SW direction are tend to be higher. Lineament density is tend to be lower in the east and west of the area, while the lineament density is tend to be somewhat higher in the center (32-ñ, 32-o) and northwest (31-m) of the area. The difference of lineament density is due to that the former area is predominantly covered by the young geologic units e.g. Tertiary to Quaternary rocks and the latter area is predominantly occupied by the old geologic units mainly consist of Paleozoic to Mesozoic formations.
More detailed observation on each Quad. revealed that the lineament density is variable accordance with the geologic units. The major tendency of lineament density in each Quad. is

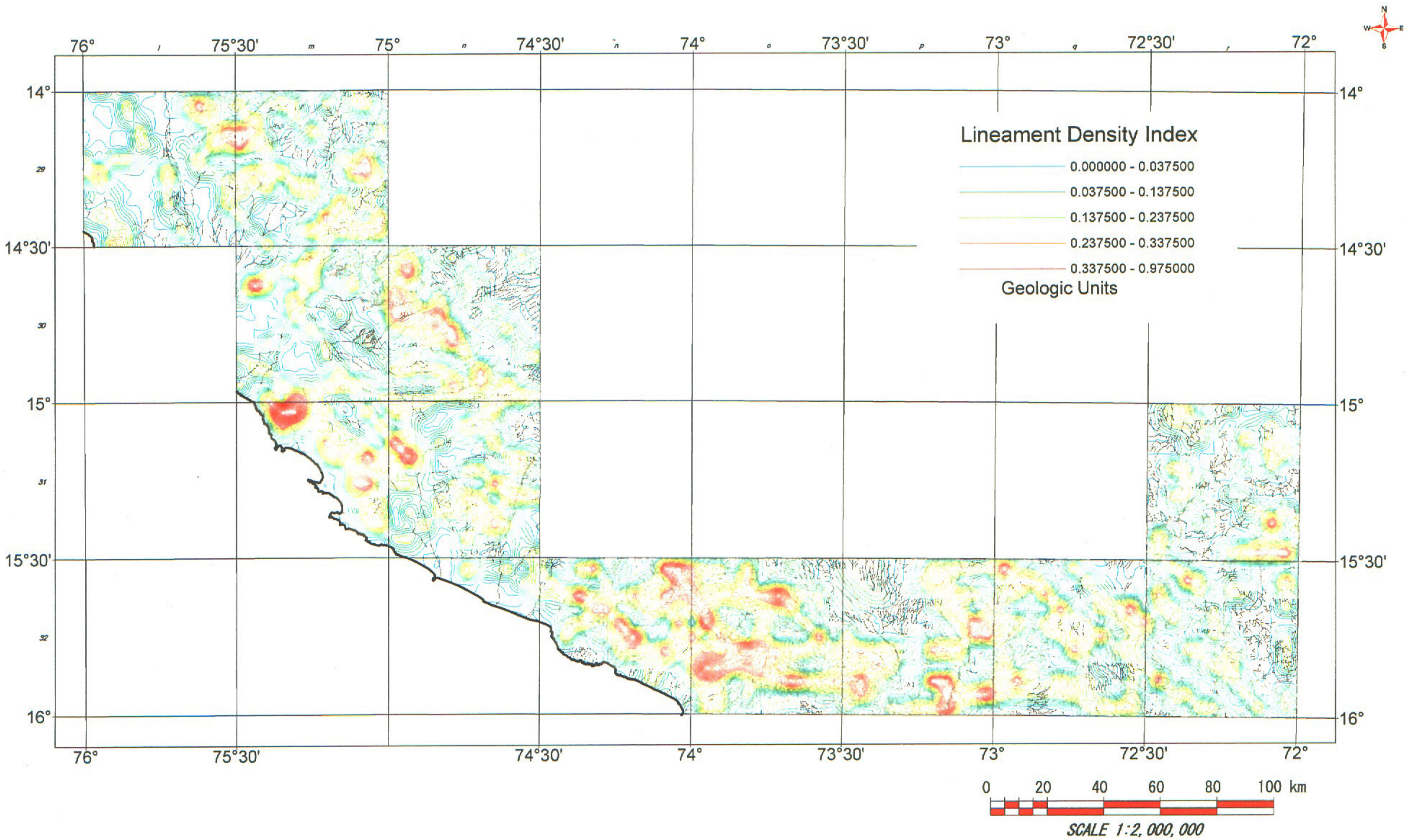

Fig.11 Lineament density map

as follows.
In the Quads. 29-l and 29-m in the west of the survey area, lineament density is tend to be higher in and around the unit Ki-ca (Lower Cretaceous volcanics).
In the Quads. 30-m and 30-n, lie to the south of the above area, lineament density is tend to be higher in the units Js-gu (upper Jurassic sediments) and Ks-ti (upper Cretaceous intrusives).
In the Quads. 31-m and 31-n, lie to the further south, lineament density is tend to be higher in the unit PeB (Precambrian metamorphics) and units Ki-bu, Ki-pt (lower Cretaceous intrusives).
In the Quads. 32-ñ, 32-o and 32-p in the central part of the survey area, lineament density is tend to be higher in the units Ji-ch (lower Jurassic sediments), Js-gu (upper Jurassic sediments), JK-yu (Jurassic to Cretaceous sediments), Pe-pa (Paleogene sediments), Ki-bu, Ki-li (lower Cretaceous intrusives) and Ks-in, Ks-ti (upper Cretaceous intrusives).
In the Quads. 32-q, 32-r and 31-r in the east of the survey area, lineament density is tend to be higher in the units JK-yu (Jurassic to Cretaceous sediments), PN-ta (Paleogene to Neogene volcanics) and Ks-ti (upper Cretaceous intrusives).

(2) Analysis of lineament trend (Fig. 12)

Taking an overview of the whole survey area, the lineaments of NW-SE direction parallel to the Andean trend is most predominant.
The lineaments of E-W, NE-SW and N-S direction are secondary predominant. The E-W lineament, however, is most predominant in the Quad. 32-o in the central part of the survey area, while the lineaments of this direction is secondary predominant in the Quad. 32-p on the east of 32-o. Predominance of the E-W lineament in the central part of the survey area is caused by the Abancay Deflection, which deflects the Andean trend in the north of the survey area. The lineament is higher in this area, probably due to the stress which formed the deflection is preserved.
Lineament of NE-SW direction is predominant in the Quads. 31-m and 32-ñ in the west and center of the survey area. The lineament of the same direction is also recognized in the Quad. 32-p.
Lineament of N-S direction is predominant in the Quads. 30-n and 31-r.

1-5 Considerations

The main results of satellite image interpretation of this year are summarized as follows:
1. Anomalies of R21 (iron oxide index) in a sizable area are located in the quadrangle 32-q, 32-r and 31-r in the east of the survey area. The anomalies tend to be larger in the geological unit PN-ta (Neogene volcanics), NQ-ba (Quarternary volcanics) and Q-and (Holocene pyroclastics), which tend to be smaller in Ks-ti (upper Cretaceous intrusives), JK-yu (Jurassic to Cretaceous sediments), Ks-se(upper Cretaceous sediments) and Ks-ar (upper Cretaceous sediments).
2. Anomalies of R57 (clay minerals index) in a sizable area are located in the quadrangle 32-q and 32-r in the east of the survey area, although they are distributed over the whole survey area. They tend to be concentrated in the geological units PeB (pre Cambrian metamorphics), JK-yu (Jurassic to Cretaceous sediments), Ks-ti (upper Cretaceous intrusives), PN-ta (Neogene volcanics), NQ-ba (Quarternary volcanics) and Q-and (Holocene pyroclastics), and also conspicuously appear in alluvium and along the river. In the east of the area, conspicuous anomalies appear in the units of JK-yu, PN-ta, NQ-ba and Q-and.
3. The lineament of Andes trend (NW-SE) is predominant in the survey area. However the lineament of E-W is predominant in the quadrangle 32-o and 32-p. This is probably due to the effect of the Abancay Deflection located on the north of this area.
4. Pattern of lineament density is generally conformable to Andes trend and the deflection

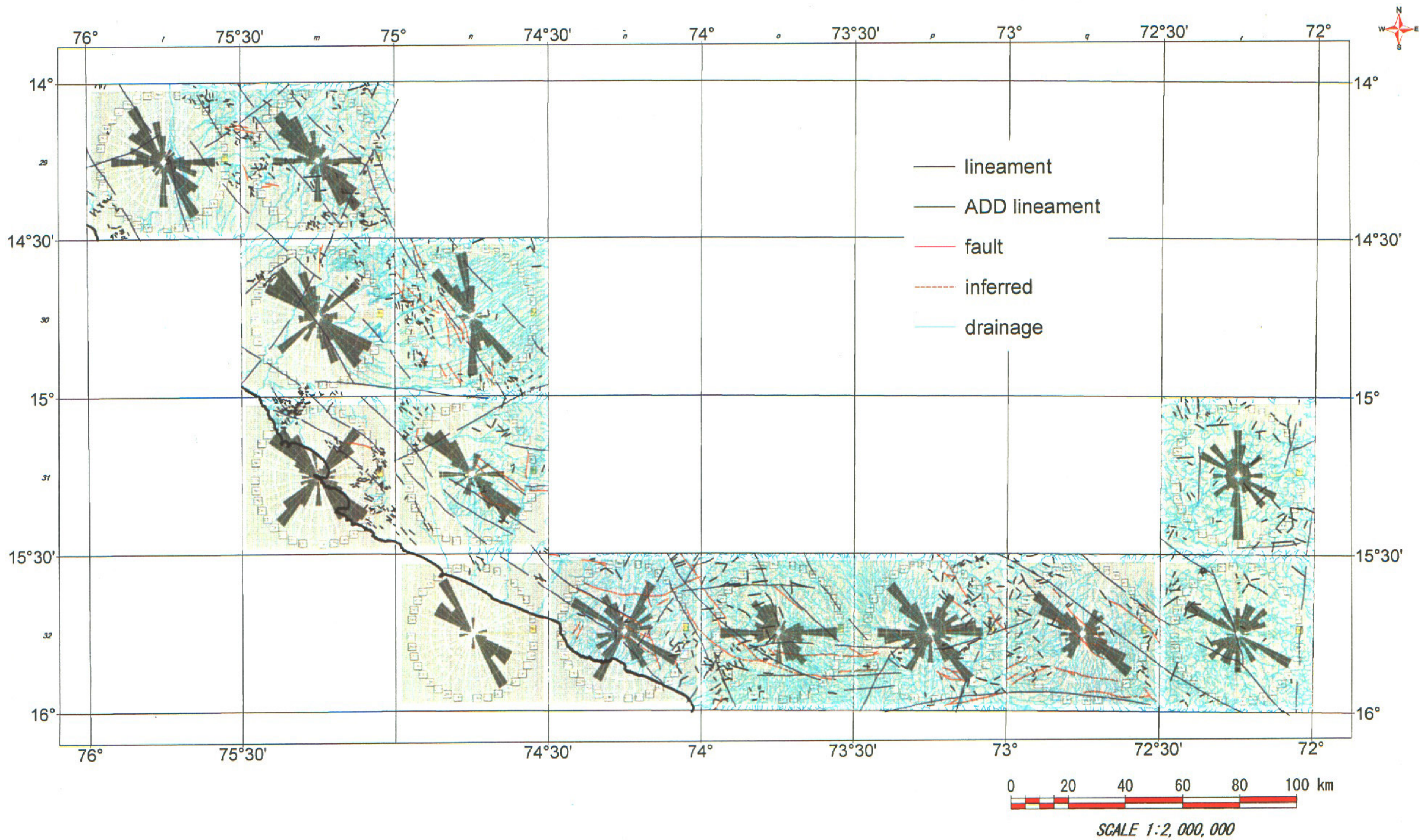

Fig.12 Lineament rose diagram

structure.

5. In comparison with geological units, the lineament density tend to be lower in the young geological unit e.g. Tertiary system and Quaternary system, while the lineament density tend to be higher in the old geological units, consisting of Paleozoic and Mesozoic formations.

Relationship between the result of image interpretation and known mineral showings is summarized as follows:

1. Vein type ore deposits predominate in the survey area. However, a correlation between lineament density and distribution of ore deposits is not clear.

2. Between the location of vein type deposits and indices of iron oxide and clay mineral, the following relationship is recognized.
   1) In case of ore deposit is located Cenozoic formation, the ore deposit is accompanied by either iron oxide index or clay mineral index in any case.
   2) In case of ore deposit is located in Mesozoic or Paleozoic formation, the ore deposit is accompanied by either index as the case may be.

3. Location of manto type ore deposits coincides with the area of high lineament density.

4. Neither iron oxide index nor clay mineral index appear in the area of manto type ore deposit.

5. Ore deposit of disseminated type and stockwork type is located around the area of relatively high lineament density.

6. Ore deposit of disseminated type and stockwork type is commonly accompanied by either iron oxide index or clay mineral index even though they are weak. Particularly this is clear in the case of ore deposits occur in Cenozoic formation.