Au: <2ppb, 1,989ppb, 23ppb, Ag: <0.5ppm, 133.8ppm, 2.1ppm, Cu: 3ppm, 134ppm, 21ppm,Pb: 6ppm, 5,540ppm, 175ppm, Zn: 2ppm, 538ppm, 51ppm, As: <5ppm, 3,453ppm, 118ppm, Sb: <5ppm, 7,918ppm, 71ppm, Hg: <1ppm, 1.7ppm, <1ppm, Mo: <1ppm, 355ppm, 9ppm, Ba: 131ppm, 5,647ppm, 1,194ppm, Sn: <5ppm, 30ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-12 (3).

Au: Four samples show anomalous values; two samples taken from adjoining localities where a barite veinlet is observed indicate 1,998 ppb and 558 ppb, respectively.

Ag: Three samples show anomalous values; two samples taken from adjoining localities where a barite veinlet is observed indicate 113.8 ppm and133.8 ppm, respectively.

Cu: Two sample show anomalous values.

Pb: 19 samples show anomalous values of 400 ppm or higher, which are insularly distributed mainly from the central to the northern parts.

Zn: Six samples show anomalous values of 230 ppm or higher, which are insularly distributed mainly in the central part.

As: Many samples show anomalous values of 140 ppm or higher, which are insularly distributed mainly from the central to the northern parts.

Sb: An anomaly zone showing 10 ppm or higher is widespread in the central part.

Hg: Five samples show 1 to 2 ppm, the others being under the detection limit.

Mo: Six samples from scattered localities show anomalous values of 40 ppm or higher.

Ba: Anomaly portions relatively concentrate in the south, while they are scattered in the central to the northern parts.

Sn: 10 samples from scattered localities show anomalous values of 10 ppm or higher.

(5) Considerations

The mineralization of Plasmar mine correspond to epithermal gold- silver- lead- zinc deosit (Type II) related to shallow volcanic activity that is estimated from the previous data and result of geochemical survey. And there is a possibility of overlapping of high-sulfidation gold- silver- copper mineraliztion (Type IV) from the presence of pyrophyllite and copper anomalies. As there is an extensive alteration zone and remarkable geochemical anomaly, the possibility of existing ore deposits in deep underground seems to be high.

2-12-2 Solución Mine

(1) Geology

The mine area is underlain by late Miocene to Pliocene pyroclastic rocks, andesite and dacite lavas and basalt intrusive rocks.

The andesite lava is underlying horblende andesite whilst overlying dacite includes biotite and hornblende and is exposed. The K-Ar dating of dacite samples collected from the upper part of old mining site (No. 2038) indicated 1.67±0.02 Ma.

The pyroclastic rocks are lapilli tuff and tuff breccia (Volcanic breccia) lying in between the andesite and the dacite, which are greenish gray and include andesite subjected to alteration up to a maximum diameter of 2 m and angular to subangular clasts of lapilli tuff.

The intrusive basalt rocks intrude into the pyroclastic rocks; two veins striking N70E, 2 m and 100 m wide, have been ascertained, which are greenish gray and smectitized.

Faults, veins and fissures with the NE-SW trend are dominant in the area.

(2) Alteration

Green argillization (smectitization), presumably the alteration caused by the intrusion of andesite, is observable over an area of about 100 m in width and 500 m extension.

White argillization zone is also observable in a narrow area, about 1 m wide, along fissures, faults and clay veins trending NE.

Quartz, smectite and kaolinite are observed as the alteration minerals.

(3) Mineralization

Old drifts remains at four locatlities in pyroclastic rocks and andesitic intrusive rocks. The longest drift reaches some 50m. All the drifts pursue clay veins, 10 to 20 cm wide, striking N25~40E and dipping 50~80W (PL-27).

The clay veins partly include lead and zinc-bearing quartz ore.

The highest assay values of the samples collected underground are Au 1.9g/t, Ag 603 g/t, Cu 0.2%, Pb 11.9% and Zn 25.2%.

Besides the clay veins, there are a small-scale quartz vein (No.2036) and a calcite vein (No. 2033) both unaccompanied by ore minerals.

(4) Assay of geochemical samples

Eight rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, 4ppb, <2ppb, Ag: <0.5ppm, <0.5ppm, <0.5ppm, Cu: 4ppm, 66ppm, 33ppm, Pb: 8ppm, 52ppm, 25ppm, Zn: 120ppm, 695ppm, 293ppm, As: <5ppm, 39ppm, 12ppm, Sb: <5ppm, 37ppm, 18ppm, Hg: <1ppm, <1ppm, <1ppm, Mo: <1ppm, 1ppm, <1ppm, Ba: 819ppm, 1,450ppm, 1,151ppm, Sn: <5ppm, <5ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-12 (3).

Au: All the samples are 4 ppb or less, showing no anomalies.

Ag: All the samples are under the detection limit.

Cu: All the samples are 66 ppm or less, showing no anomalies.

Pb: All the samples are 52 ppm or less, showing no anomalies.

Zn: Four samples show 400 ppm or higher.

As: All the samples are 39 ppm or less, showing no anomalies.

Sb: All the samples but one show anomalous values of 10 ppm or higher.

Hg: All the samples are under the detection limit.

Mo: All the samples are 1 ppm or less.

Ba: All the samples are 1,450 ppm or less, showing no anomalies.

Sn: All the samples are under the detection limit.

(5) Considerations

The mineralization of Solucion mine corresponds to epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity from the previous data analysis and geochemical assay result. Judging from the mode of occurrence and size of ore deposit in underground working, and extent of geochemical anomaly and alteration, the possibility of existing a large-scale ore deposit seems to be low.

2-13 Colorado District

In the District, Rio Amarillo S.A. conducted exploration around 1972 while, recently, Andean Silver Inc. (?) has performed geophysical and other surveys.

2-13-1 Bayos Prospect(Figs.II-2-13,II-2-13(1 to 3))

(1) Geology

Pyroclastic rocks such as tuff, lapilli tuff and tuff breccia, as well as andesite lava are distributed, which are considered to be the Cordillerita lavas of the late Pliocene age.

The pyroclastic rocks are light brown- to white-colored and include rock fragments up to 5 cm in diameter.

As regards the andesite, coarse-grained, porphyritic and dark gray- to gray-colored pyroxene-biotite andesite and fine-grained, dark gray-colored pyroxene andesite are observed.

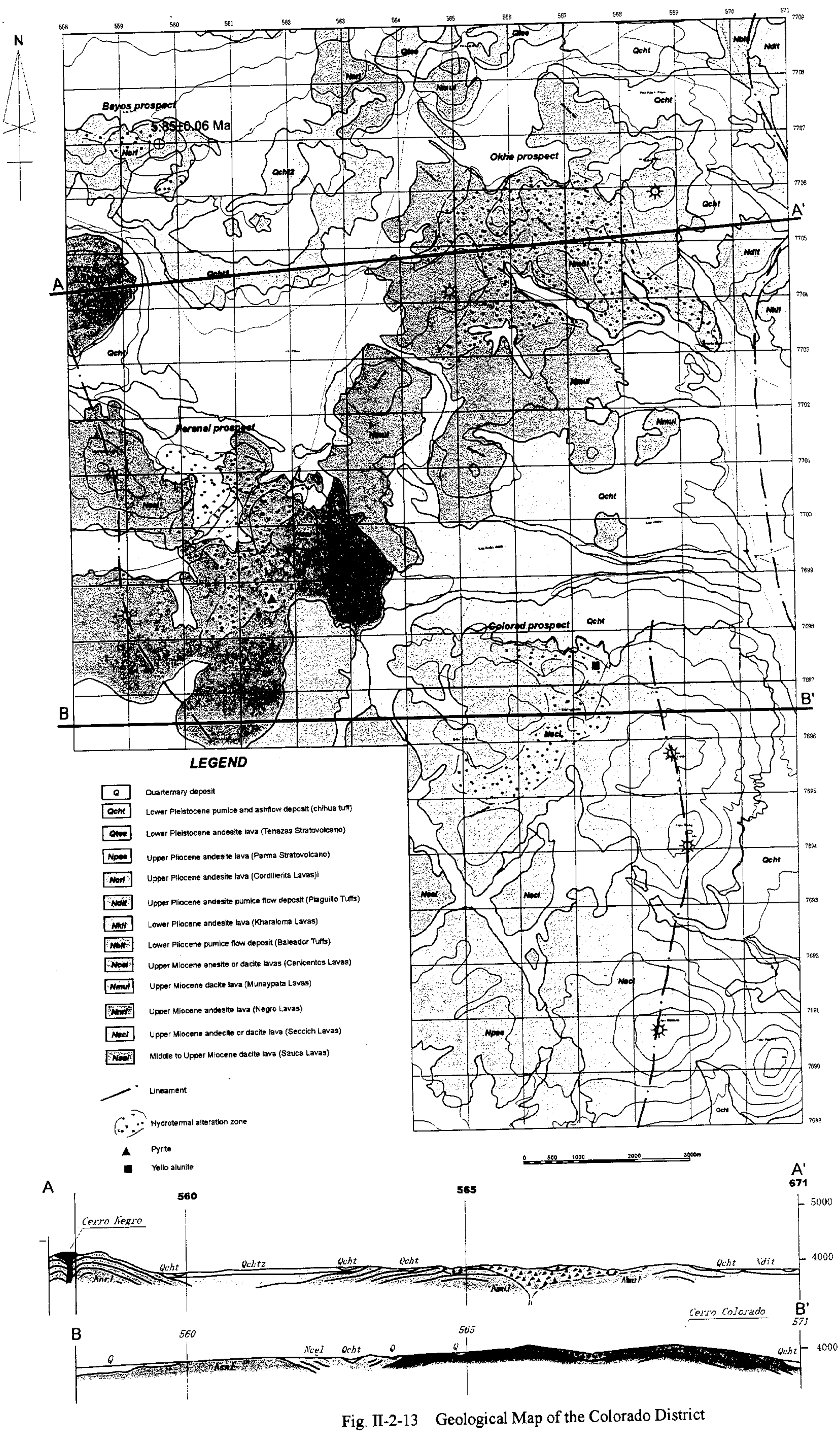


Fig. II-2-13 Geological Map of the Colorado District

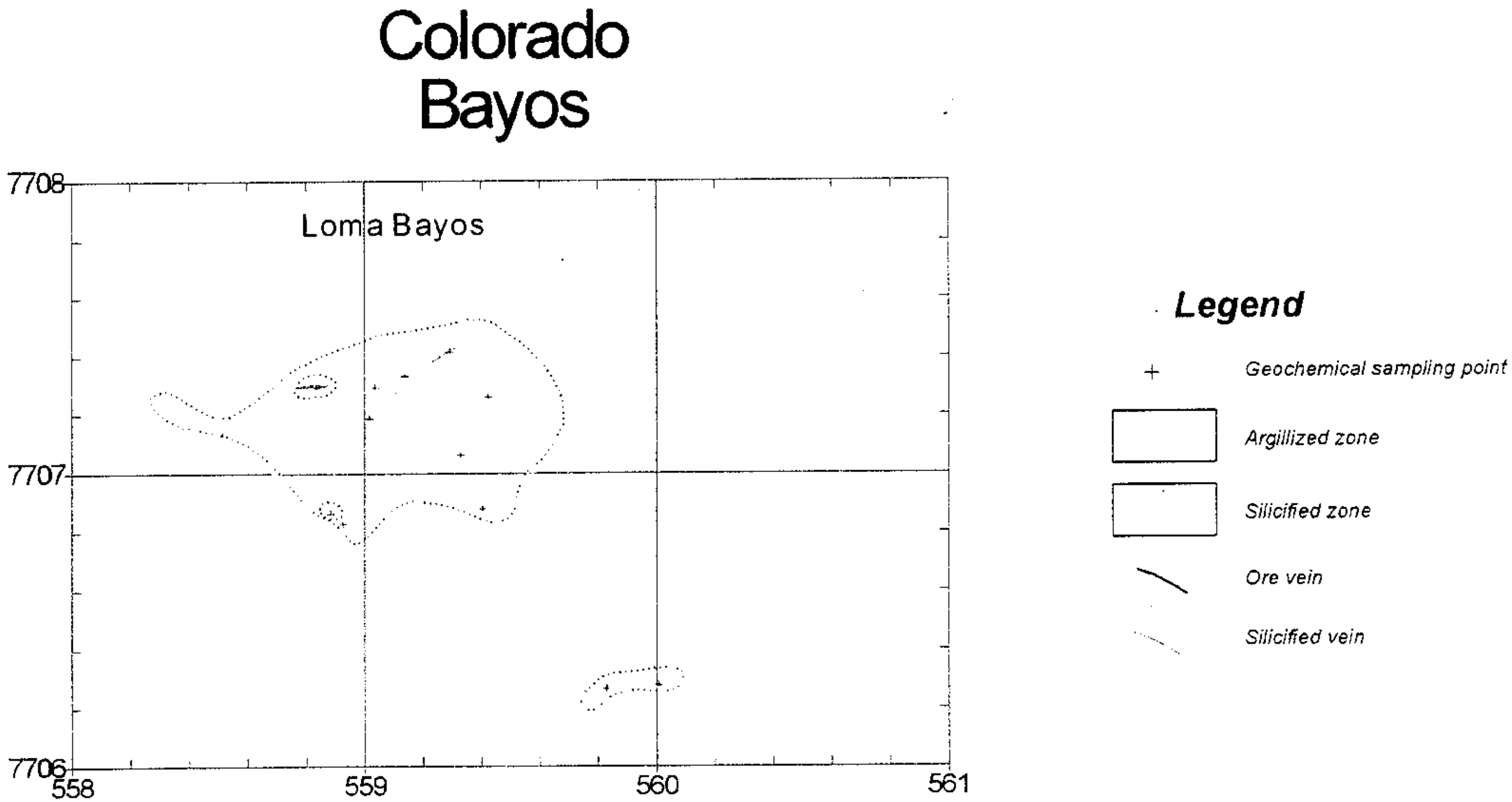


Fig.II-2-13 (1)Alteration Map of the Colorado District (Bayos)

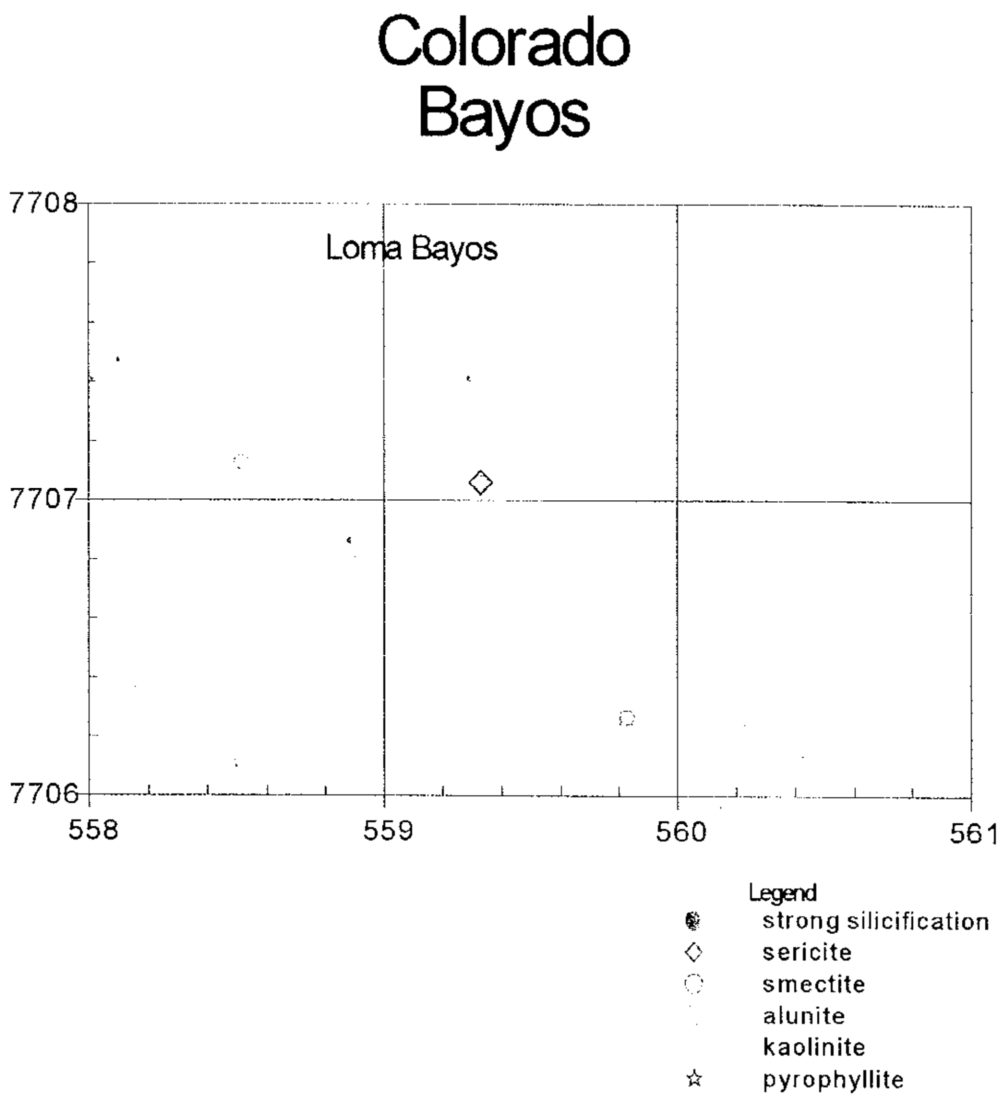


Fig.II-2-13 (2)Distribution Map of Alteration Minerals in the Colorado District (Bayos)

The K-Ar dating of the coarse-grained biotite-pyroxene andesite indicates 5.85±0.06 Ma (No. 4927).

Faults, veins and fissures in the Prospect trend E-W and NE-SW.

(2) Alteration

Hydrothermal alteration zones are as narrow as 0.5 km^2.

Silicification and argillization are observed, the latter being predominant.

Circular hydrothermal breccia, approximately 150m in diameter, is present; it includes subangular fragments of dark gray biotite andesite up to 6 m in diameter.

Smectite, alunite, quartz and sericite are observable as the alteration minerals.

(3) Mineralization

No indications of mineralization have been ascertained in the Prospect.

(4) Assay of geochemical samples

Thirteen rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, <2ppb, <2ppb, Ag: <0.5ppm, <0.5ppm, <0.5ppm, Cu: 3ppm, 113ppm, 27ppm,
Pb: <3ppm, 60ppm, 20ppm, Zn: 4ppm, 83ppm, 20ppm, As: <5ppm, 1,293ppm, 151ppm,
Sb: <5ppm, 15ppm, <5ppm, Hg: <1ppm, <1ppm, <1ppm, Mo: <1ppm, 11ppm, 5ppm,
Ba: 62ppm, 2,132ppm, 915ppm, Sn: <5ppm, <5ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-13 (3).

Au: All the samples are under the detection limit.

Ag: All the samples are under the detection limit.

Cu: An anomalous value of 113 ppm has been detected at a part of the circular hydrothermal breccia.

Pb: All the samples are under 60 ppm, showing no anomalies.

Zn: All the samples are under 80 ppm, showing no anomalies.

As: Two samples indicate anomalous values of 140 ppm or higher.

Sb: Three samples indicate anomalous values of 10 ppm or higher.

Hg: All the samples are under the detection limit.

Mo: All the samples are 11 ppm or less, showing no anomalies.

Ba: Three samples show anomalous values of 1,500 ppm or higher.

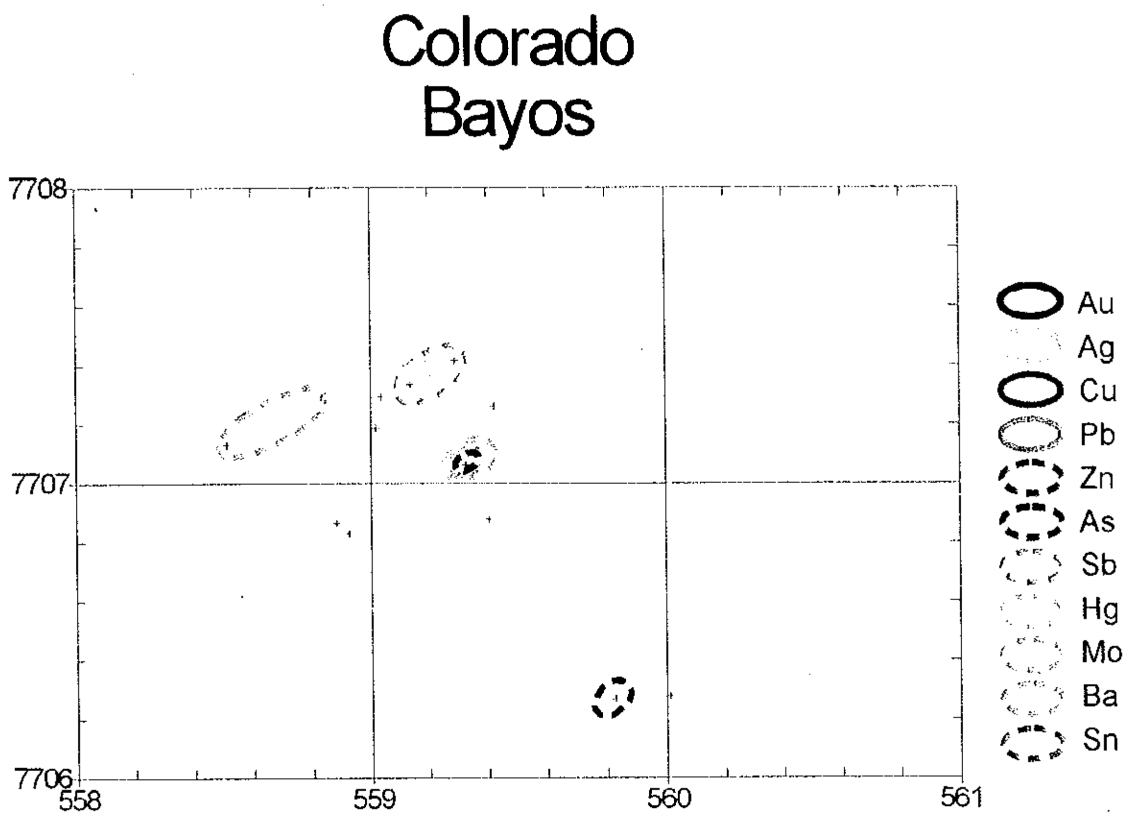


Fig.II-2-13 (3)Geochemical Anomaly Map of the Colorado District (Bayos)

Sn: All the samples are under the detection limit.

(5) Considerations

The mineralization in Bayos prospect seems to be weak or deep-seated if it exists, as the hydrothermal breccia is small, consisting mainly of argilization and there is non of remarkable geochemical anomaly.

2-13-2 Okhe Prospect(Figs.II-2-13,II-2-13(4 to 6))

(1) Geology

The Prospect is unerlain by the Munaypata lavas of the late Miocene age, composed of pyroclastic rocks such as tuff, lapilli tuff and tuff breccia, as well as andesite lava.

The pyroclastic rocks are distributed in topographically lower parts, whereas the biotite andesite lava is distributed in higher parts.

The K-Ar dating of samples taken at the southern piedmont indicates 8.6±0.5 Ma, according to the existing information.

Faults, veins and fissures in the Prospect trend NNW-SSE and NNE-SSW.

(2) Alteration

Hydrothermal alteration zones cover approximately 11 km^2.

Silicification and argillization are observed; small-scale, strong- to medium-grade silicification zones are spotted within extensive argillization zones.

Mainly the underlying pyroclastic rocks have undergone alteration whilst the overlying lavas are only partially altered.

Quartz, alunite and kaolinite are observable as the alteration minerals.

(3) Mineralization

No indication of mineralization is ascertained in the Prospect.

(4) Assay of geochemical samples

Fifty-two rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, 2ppb, <2ppb, Ag: <0.5ppm, <0.5ppm, <0.5ppm, Cu: 2ppm, 75ppm, 20ppm,
Pb: <3ppm, 39ppm, 14ppm, Zn: <2ppm, 89ppm, 15ppm, As: <5ppm, 618ppm, 54ppm,
Sb: <5ppm, 26ppm, <5ppm, Hg: <1ppm, 1.6ppm, <1ppm, Mo: 1ppm, 16ppm, 5ppm,

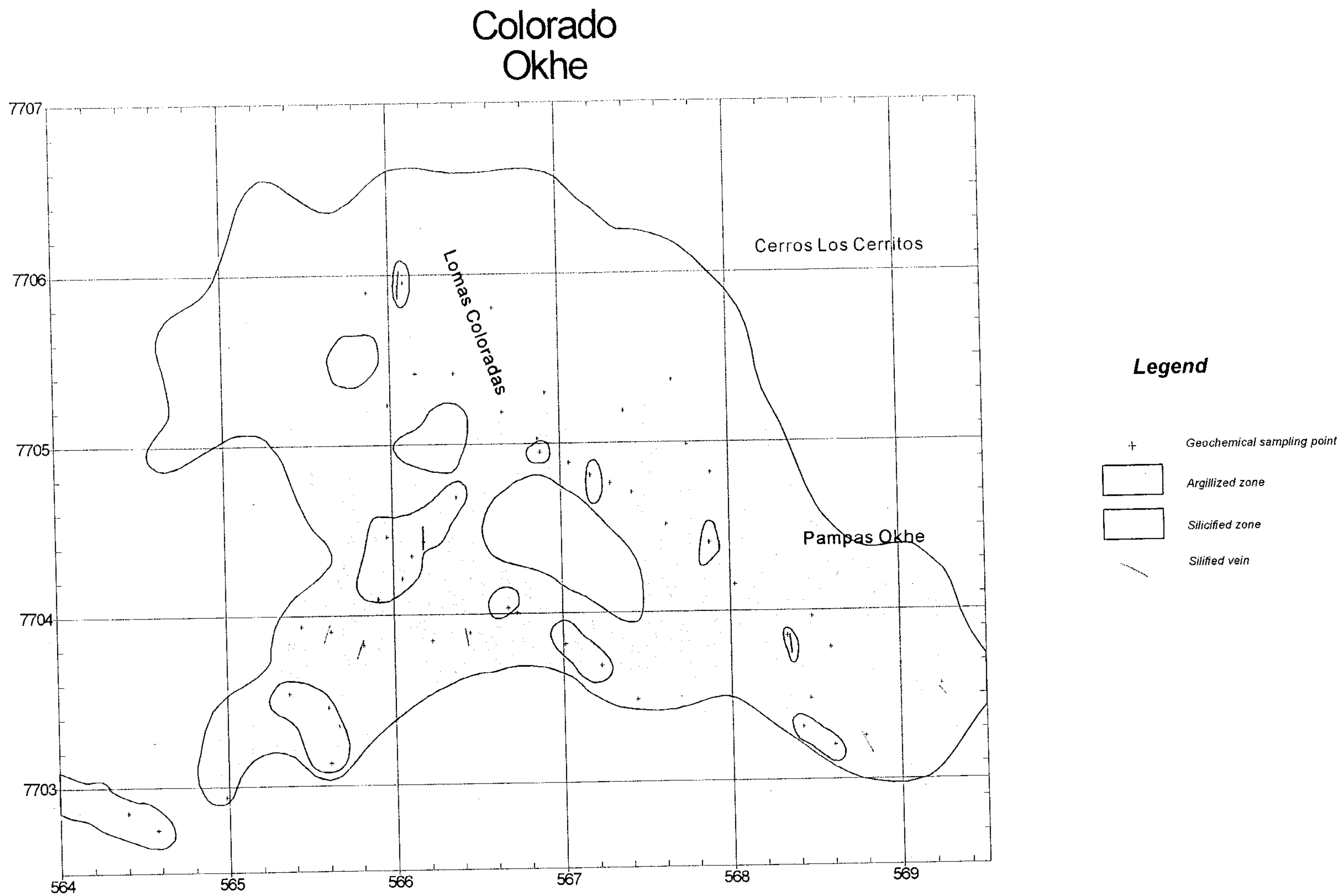


Fig.II-2-13 (4)Alteration Map of the Colorado District (Okhe)

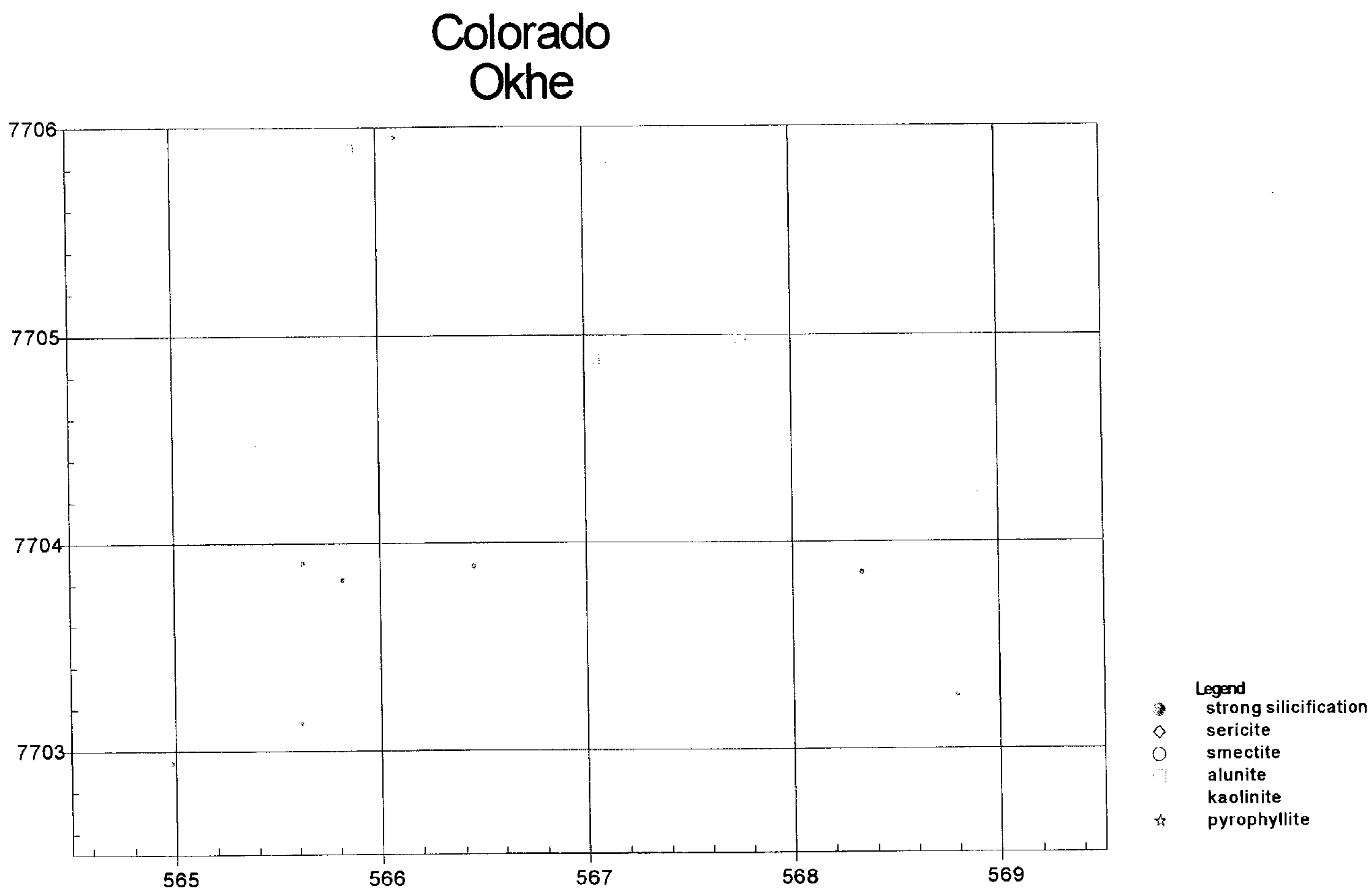


Fig.II-2-13 (5)Distribution Map of Alteration Minerals in the Colorado District (Okhe)

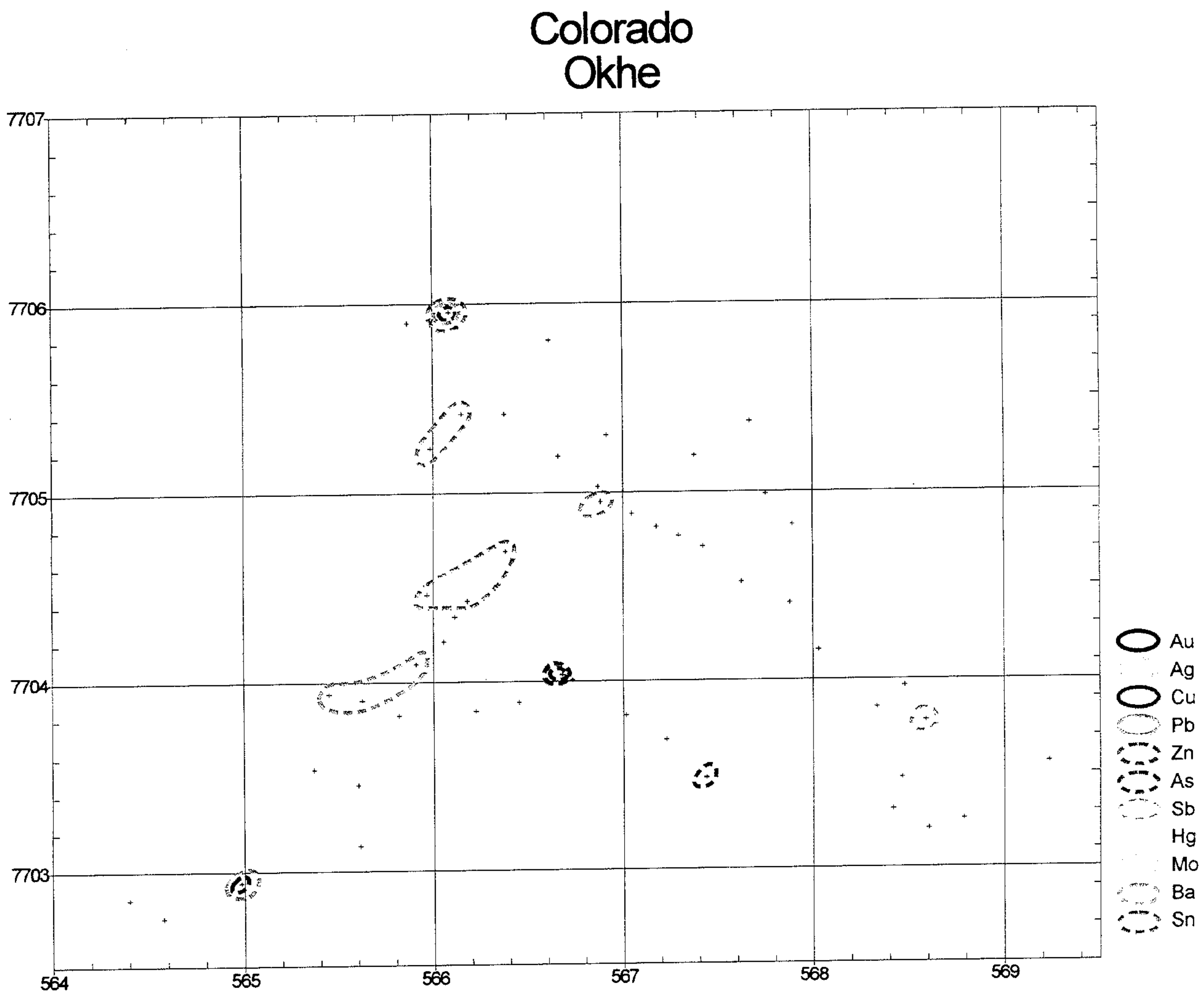


Fig.II-2-13 (6)Geochemical Anomaly Map of the Colorado District (Okhe)

Ba: 26ppm, 3,955ppm, 985ppm, Sn: <5ppm, 11ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-13 (6).

Au: All but two samples that indicate 2 ppb are under the detection limit.

Ag: All the samples are under the detection limit.

Cu: All the samples are 75 ppm or less, showing no anomalies.

Pb: All the samples are 39 ppm or less, showing no anomalies.

Zn: All the samples are 89 ppm or less, showing no anomalies.

As: There is an anomaly zone where four samples indicate 140 ppm or higher.

Sb: There are anomaly zones where 10 ppm or higher values are detected at five localities.

Hg: Except two samples showing 1.6 ppm and 1.0 ppm and all the others are under the detection limit.

Mo: All the samples are 16 ppm or less, showing no anomalies.

Ba: Anomalous values of 1,500 ppm or higher are detected at three localities.

Sn: A sample indicates an anomalous value of 11 ppm, which overlaps the arsenic anomaly.

(5) Considerations

The mineralization in Okhe prospect is presumed to correspond to an epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity from the presence of tin. The mineralization seems to be weak or deep-seated if it exists, as the alteration and geochemical anomalies are weak.

2-13-3 Perenal Prospect(Figs.II-2-13,II-2-13(7 to 9))

(1) Geology

The prospect is underlain by pyroclastic rocks such as tuff, lapilli tuff and tuff breccia (volcanic breccia), as well as andesite lava, which are considered to be the Sauca lavas of the middle Miocene age.

The pyroclastic rocks, which cover topographically lower parts, have undergone hydrothermal alteration and are gray- to grayish white-colored.

The andesite lava, which covers topographically higher parts in general, is composed of dark gray hornblende-biotite andesite, partially subjected to hydrothermal alteration. The dating as recorded in the existing information indicates 10.0±0.6 Ma.

Faults, veins and fissures in the Prospect trend NE-SW and NW-SE.

(2) Alteration

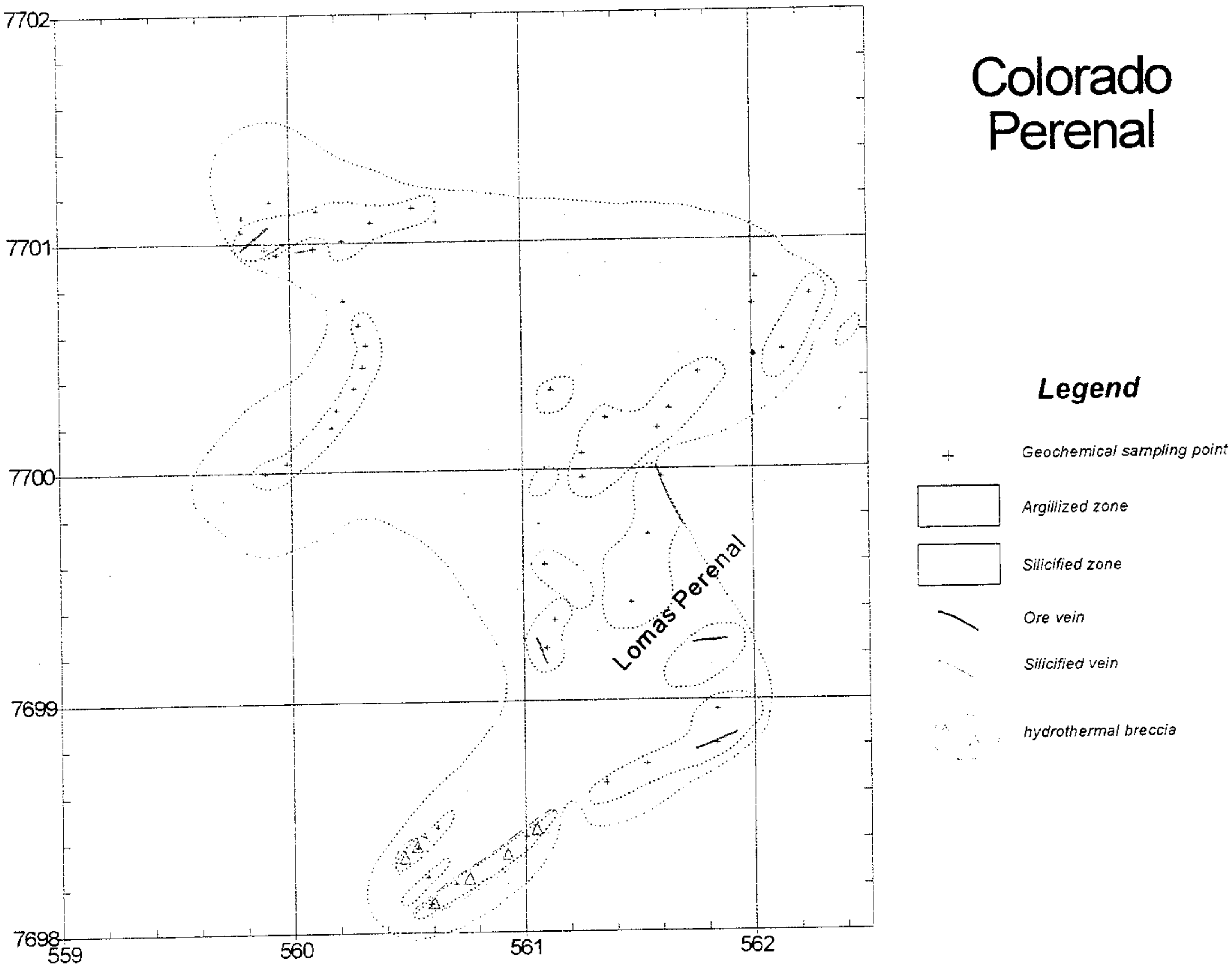


Fig.II-2-13 (7)Alteration Map of the Colorado District (Perenal)

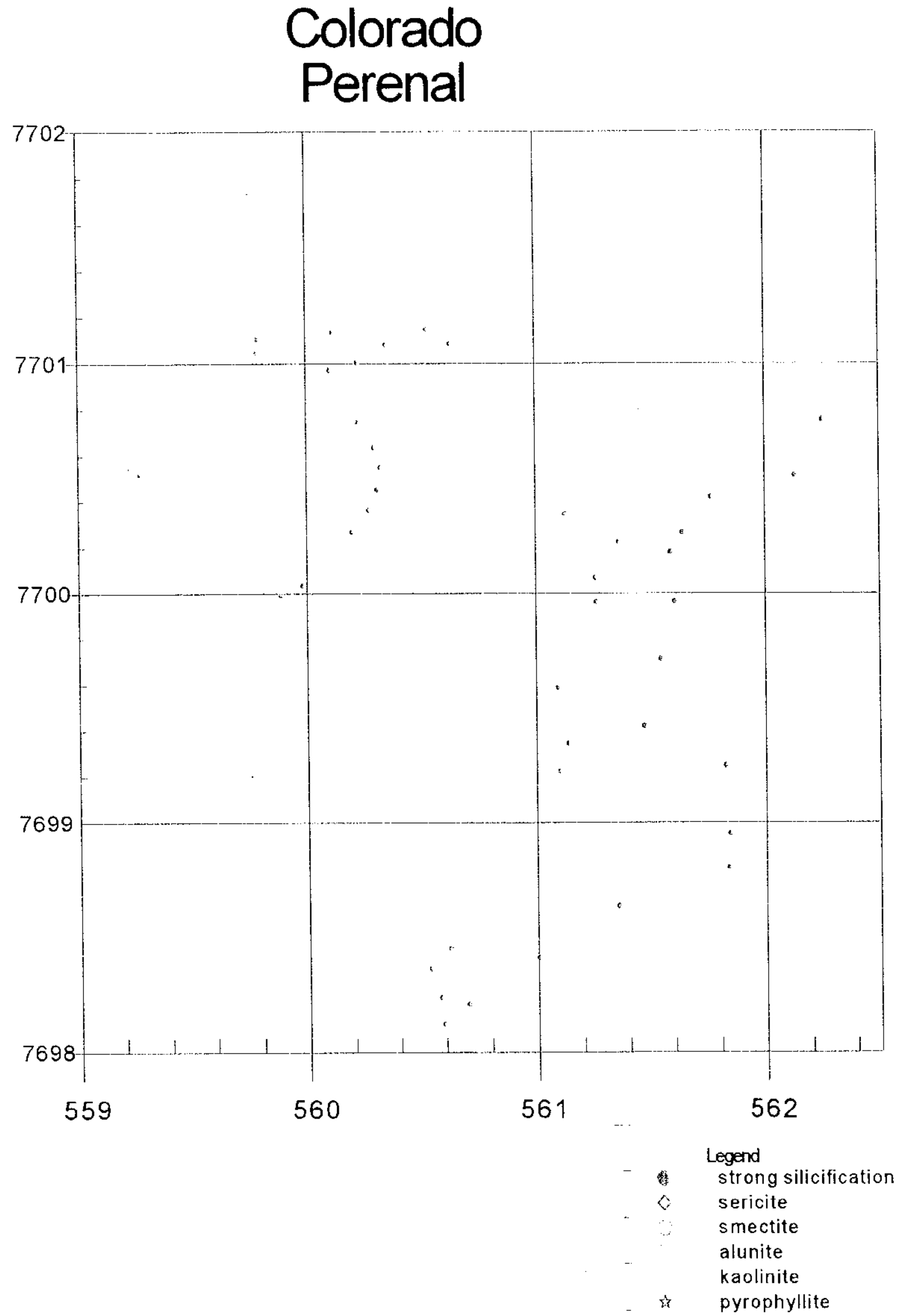


Fig.II-2-13 (8)Distribution Map of Alteration Minerals in the Colorado District (Perenal)

Hydrothermal alteration zones cover approximately 5 km^2.

Silicification and argillization are observed; silicification zones are continuously spotted in the NE-SW direction within extensive argillization zones.

Quartz, kaolinite, alunite and smectite are observable as the alteration minerals.

(3) Mineralization

Pyrite mineralization is observed at a locality.

(4) Assay of geochemical samples

Fourty-nune rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, 5ppb, <2ppb, Ag: <0.5ppm, 2.0ppm, <0.5ppm, Cu: 5ppm, 49ppm, 13ppm, Pb: <3ppm, 702ppm, 27ppm, Zn: 2ppm, 34ppm, 9ppm, As: <5ppm, 442ppm, 75ppm, Sb: <5ppm, 27ppm, <5ppm, Hg: <1ppm, 2.2ppm, <1ppm, Mo: 2ppm, 22ppm, 8ppm, Ba: 109ppm, 1,832ppm, 767ppm, Sn: <5ppm, 14ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-13 (9).

Au: All the samples are 5 ppb or less, showing no anomalies.

Ag: All but a sample that indicates 2.0 ppm are under the detection limit.

Cu: All the samples are 49 ppm or less, showing no anomalies.

Pb: A sample shows an anomalous value of 702 ppm.

Zn: All the samples are 34 ppm or less, showing no anomalies.

As: Nine samples indicate 140 ppm or higher; anomalous parts are spotted.

Sb: Two samples show anomalous values of 10 ppm or higher.

Hg: A sample shows an anomalous value of 2.2 ppm, while the others are mostly under the detection limit.

Mo: A sample shows an anomalous value of 22 ppm.

Ba: A sample shows an anomalous value of 1,832 ppm.

Sn: A sample shows an anomalous value of 14 ppm, which overlaps the molybdenum anomaly.

(5) Considerations

The mineralization in Perenal prospect correspond to an epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity presumed from the presence of lead and tin. The existence of ore deposits is expected, as the silicification is strong and extend toward north-

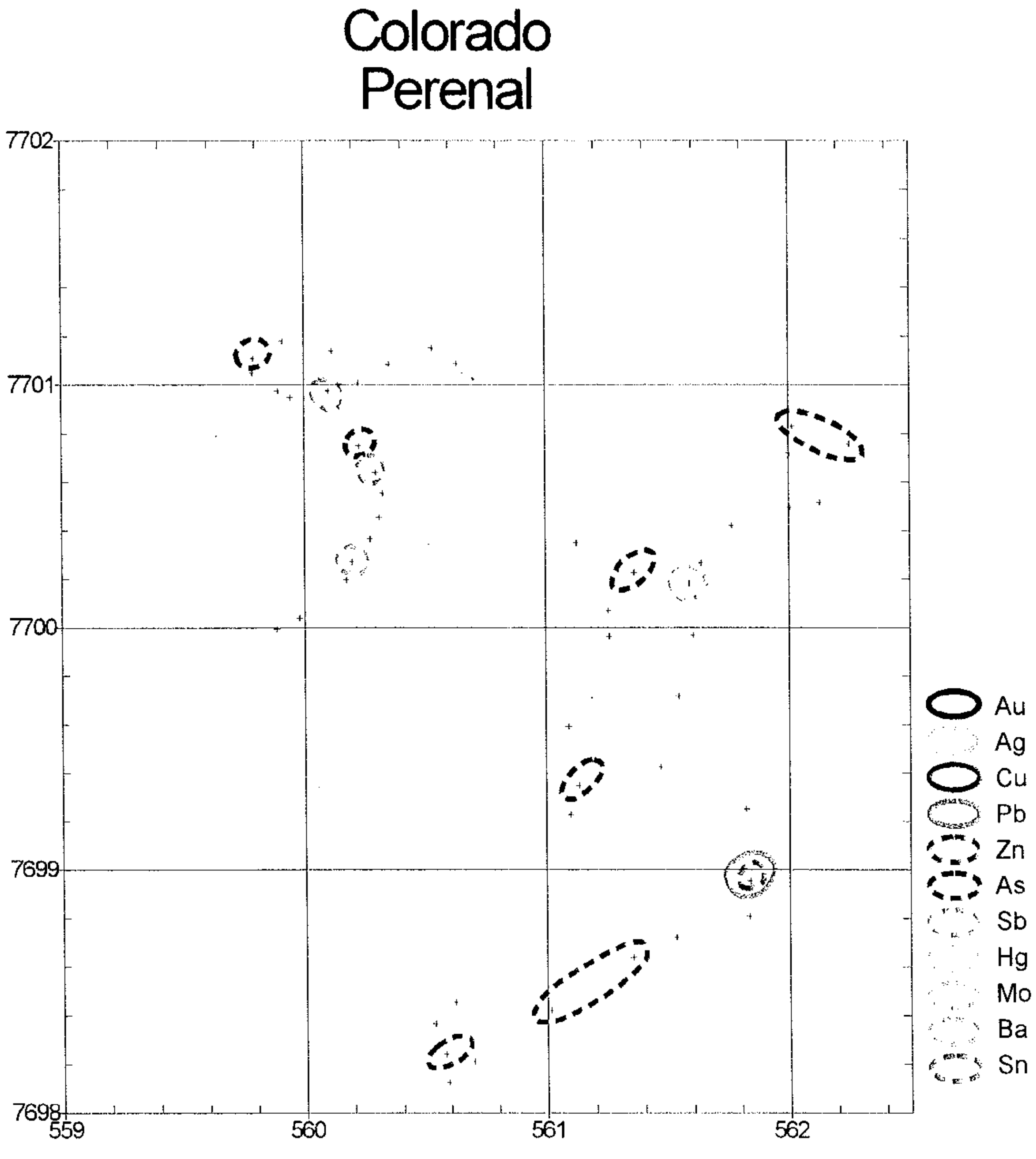


Fig.II-2-13 (9)Geochemical Anomaly Map of the Colorado District (Perenal)

west.

2-13-4 Colorado Prospect(Figs.II-2-13,II-2-13(10 to 12))

(1) Geology

The Prospect is underlain by pyroclastic rocks such as tuff, lapilli tuff and tuff breccia (volcanic breccia), as well as andesite lava, which are considered to be the Seccicha lavas of middle to late Miocene age. These rocks are overlain by the Pleistocene Chiua tuff along the northern basin.

The pyroclastic rocks cover lower parts whereas the andesite lava covers higher parts.

The pyroclastic rocks, mostly subjected to hydrothermal alteration, are purplish gray- to light gray- and to grayish white-colored and include subangular to subrounded andesite fragments up to a size of 10 cm.

The andesite lava is relatively fresh, in which coarse-grained, dark gray- to light gray-colored biotite andesite and fine-grained, dark gray pyroxene andesite are observed.

The Chiua tuff is light gray to light brown and includes angular to subrounded fragments up to a maximum diameter of 7 cm, averaging 1 to 2 cm, of dark gray hornblende andesite, pumice, dark gray biotite andesite and tuff.

Faults, veins and fissures in the Prospect trend E-W and NW-SE.

(2) Alteration

Hydrothermal alteration zones cover approximately 3 km^2.

Silicification and argillization are observed; vein-like and small-scale, massive silicification zones lie within extensive argillization zones.

The underlying pyroclastic rocks have undergone alteration, while the overlying andesites are only partially subjected to alteration.

Quartz, smectite, sericite, kaolinite, alunite and pyrophyllite are observable as the alteration minerals.

(3) Mineralization

No indication of mineralization is discerned except an intensively silicified zone where concentration of yellow-colored alunite has been ascertained.

(4) Assay of geochemical samples

Twenty-four rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, <2ppb, <2ppb, Ag: <0.5ppm, <0.5ppm, <0.5ppm, Cu: 4ppm, 52ppm, 16ppm,

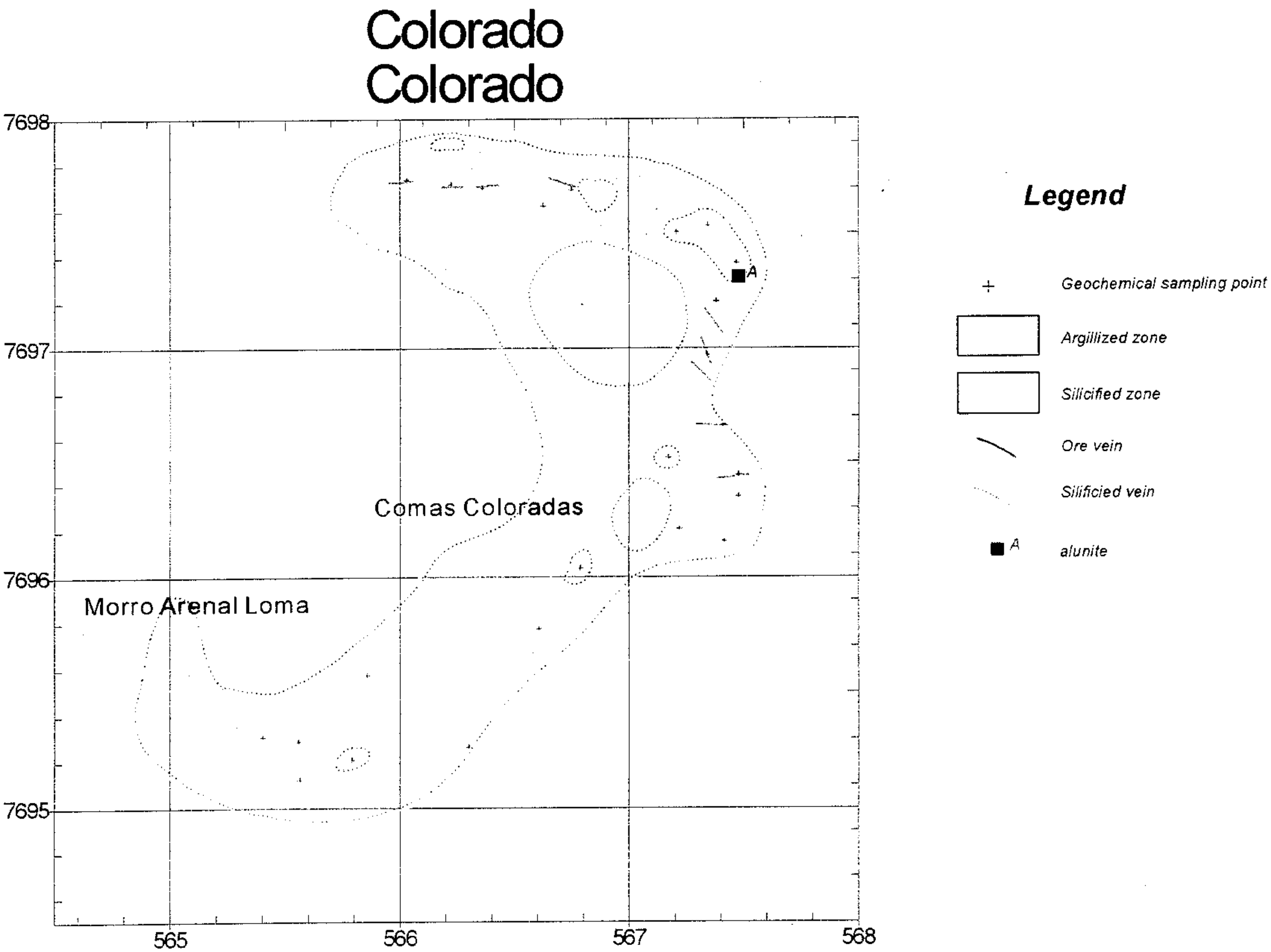


Fig.II-2-13 (10)Alteration Map of the Colorado District (Colorado)

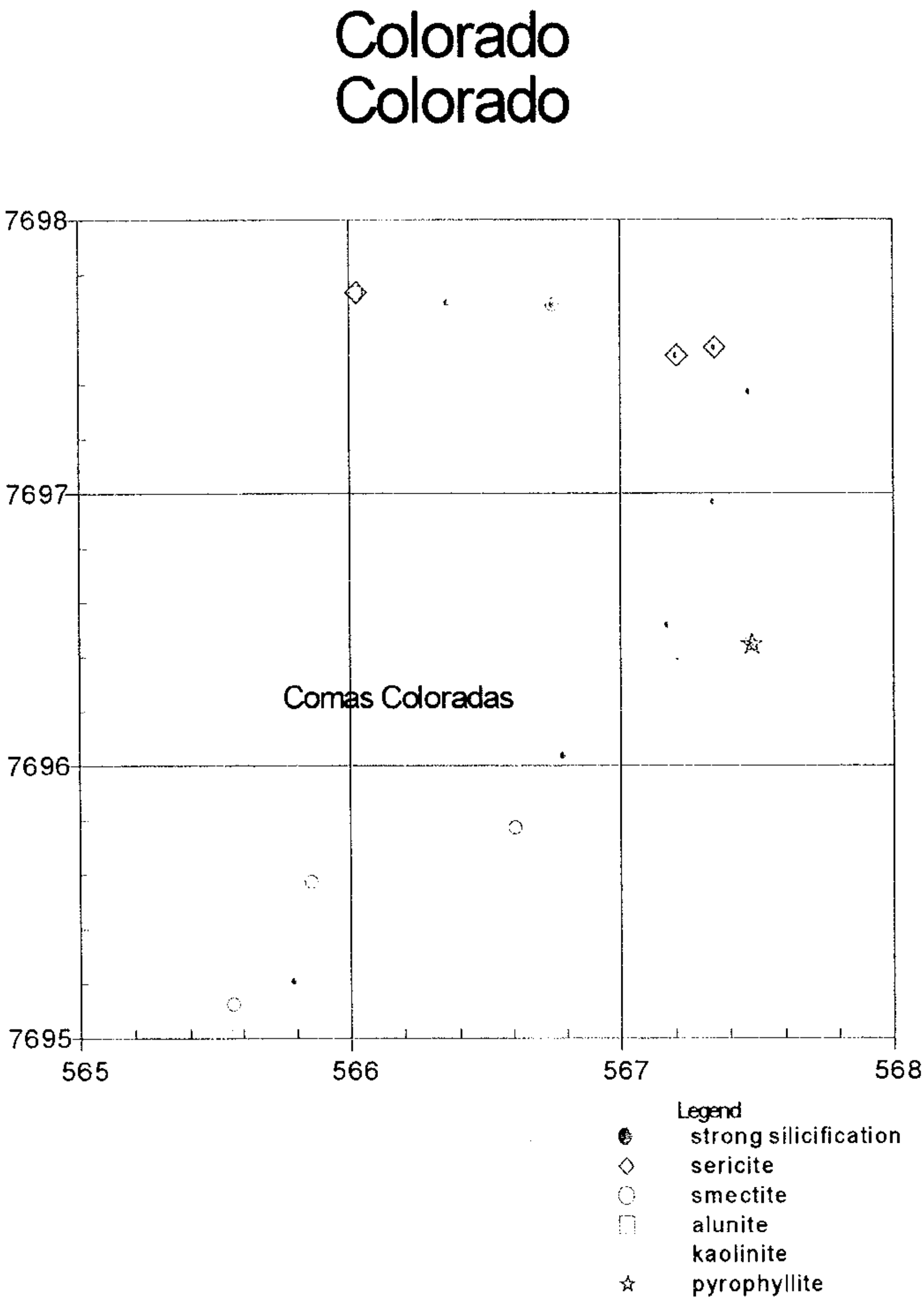


Fig.II-2-13 (11)Distribution Map of Alteration Minerals in the Colorado District (Colorado)

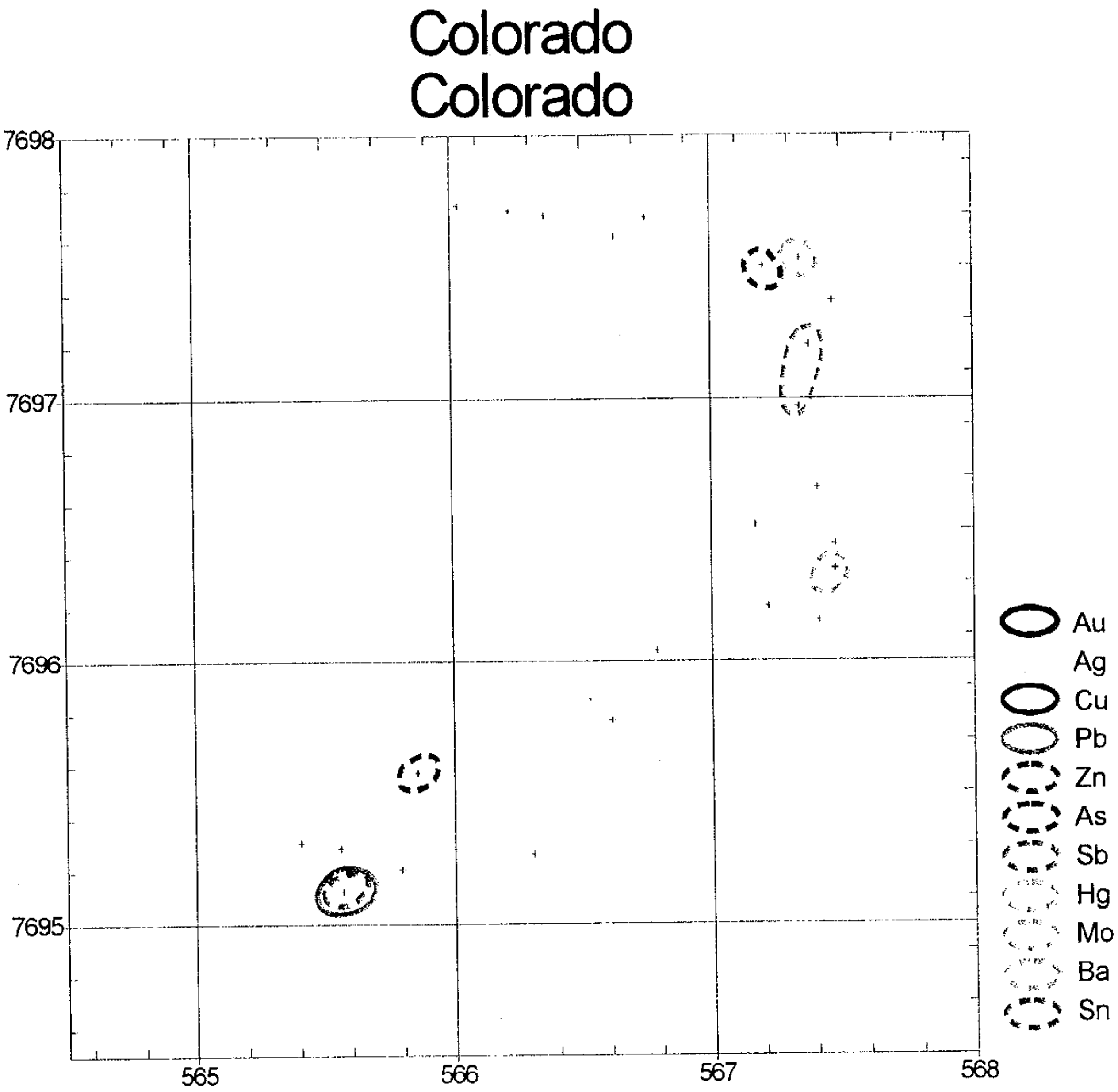


Fig.II-2-13 (12)Geochemical Anomaly Map of the Colorado District (Colorado)

Pb: <3ppm, 1,060ppm, 65ppm, Zn: <2ppm, 27ppm, 7ppm, As: 6ppm, 211ppm, 41ppm, Sb: <5ppm, 88ppm, <5ppm, Hg: <1ppm, <1ppm, <1ppm, Mo: <1ppm, 15ppm, 5ppm, Ba: 176ppm, 3,532ppm, 801ppm, Sn: <5ppm, <5ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-13 (12).

Au: All the samples are under the detection limit.

Ag: All the samples are under the detection limit.

Cu: All the samples are 52 ppm or less, showing no anomalies.

Pb: A sample taken in the south shows an anomalous value of 1,060 ppm, while all the others showed 140 ppm or less.

Zn: All the samples are 27 ppm or less, showing no anomalies.

As: Two samples, occurring independently, show anomalous values of 140 ppm or higher.

Sb: Three samples show anomalous values of 10 ppm or higher; especially, the one taken in the south show 88 ppm, which overlaps the lead anomaly.

Hg: All the samples are under the detection limit.

Mo: All the samples are 15 ppm or less, showing no anomalies.

Ba: Two samples, occurring independently, show anomalous values of 1,500 ppm or higher.

Sn: All the samples are under the detection limit.

(5) Considerations

The mineralization in Colorado prospect corresponds to a high-sulfidation mineralization (Type IV) from the presence of pyrophyllite. It is also possible to be an epithermal gold- silver- lead- zinc deposit (Type II) though there is no tin anomaly. The mineralization appears to be weak or deep-seated if it exists, as the area is located in outer most of alteration zone and geochemical anomalies are weak.

2-14 Luxsar District(Figs.II-2-14,II-2-14(1 to 3))

(1) Geology

The District is underlain by the Luxsar stratovolcanic rocks of the late Miocene age, composed of pyroclastic rocks such as tuff, lapilli tuff and tuff breccia (volcanic breccia), as well as andesite lava and andesite domes.

The lapilli tuff and tuff breccia include subrounded to subangular fragments of andesite and granite up to 15 cm in diameter.

The andesite lava is dark gray- to gray- and to grayish white-colored hornblend andesite. The K-Ar dating of samples collected on the southern slope of Mt. Luxsar indicates 5.6±0.3 Ma,

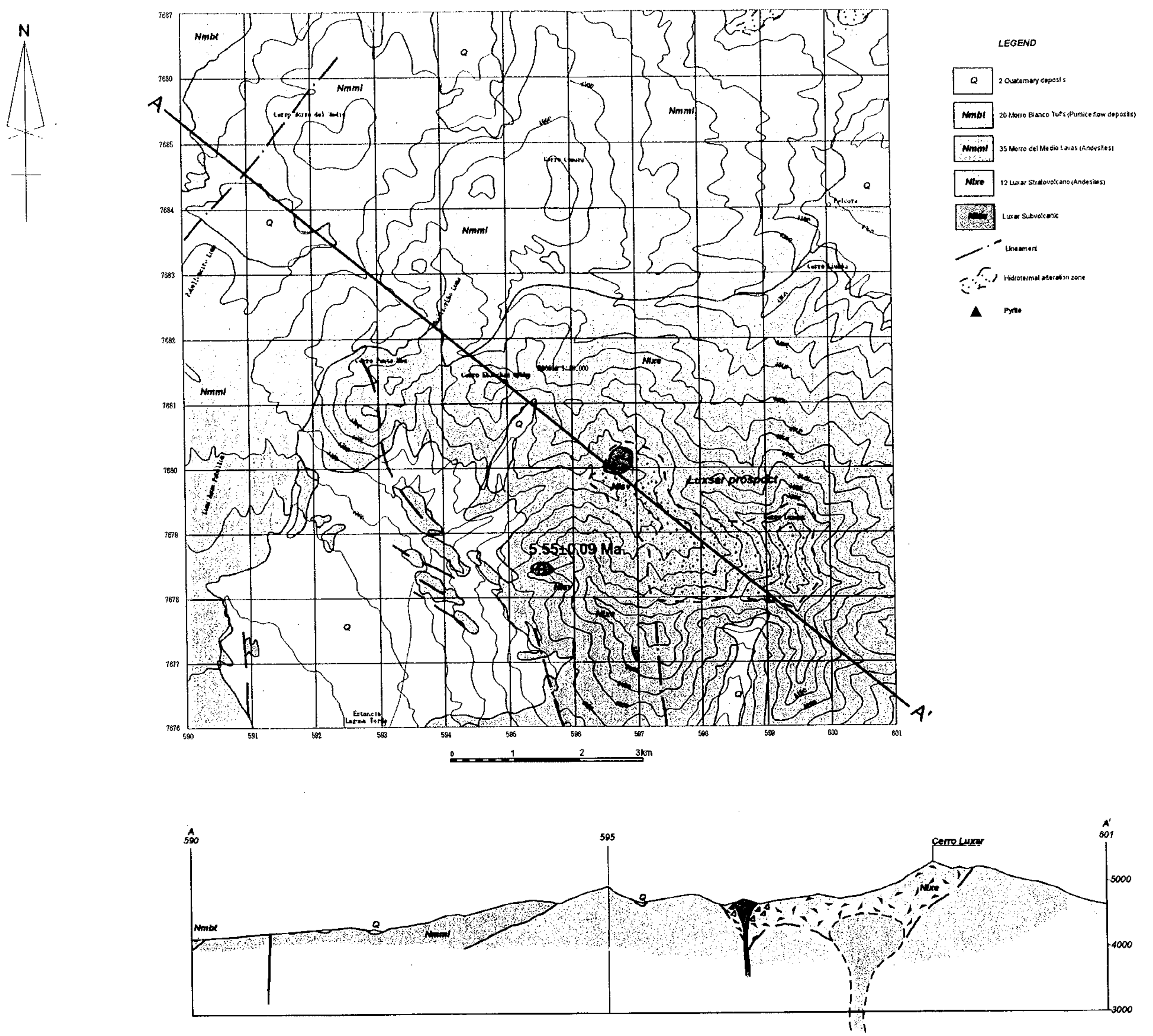


Fig. II-2-14 Geological Map of the Luxsar District

Luxsar

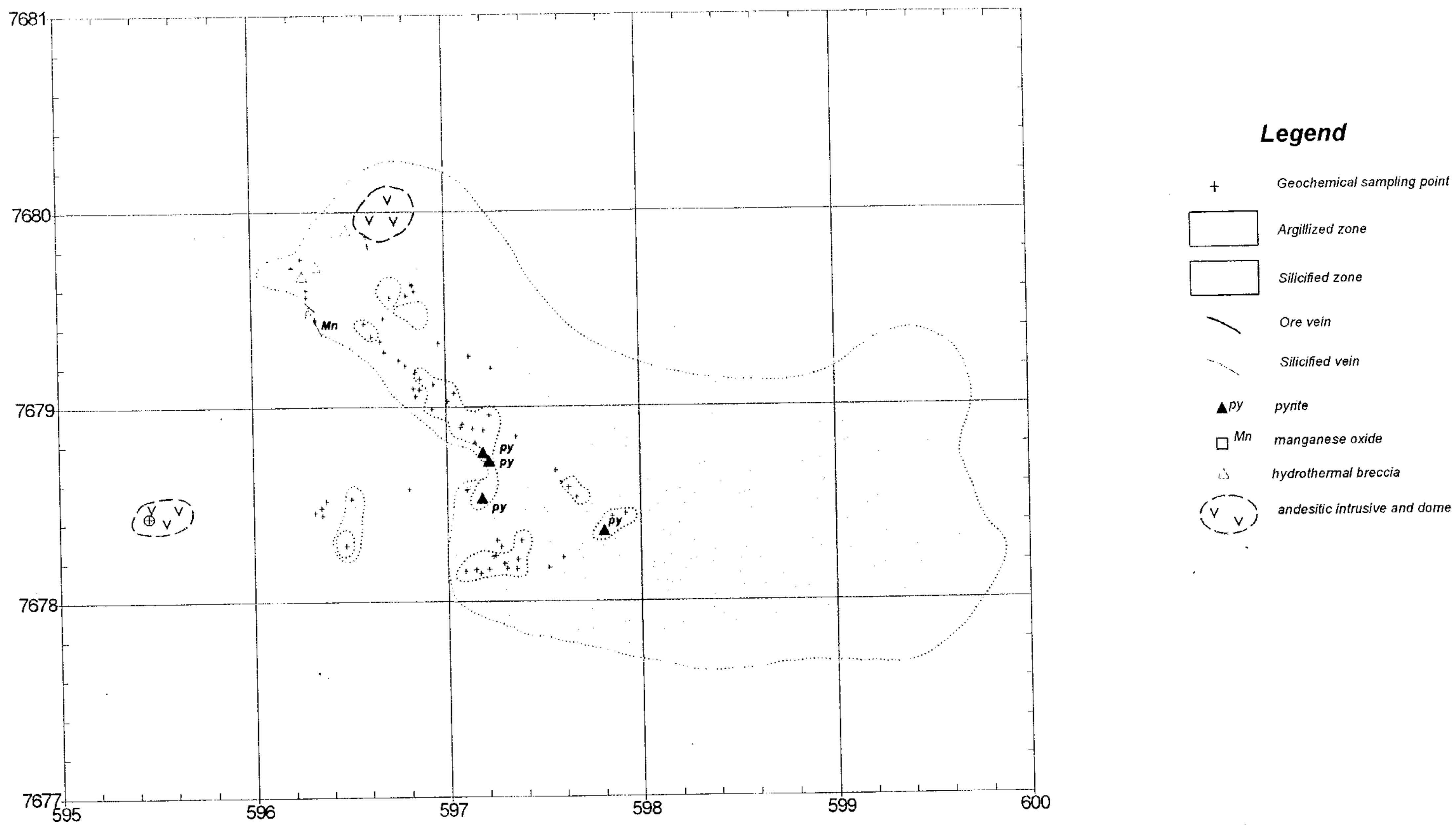


Fig.II-2-14 (1)Alteration Map of the Luxsar District

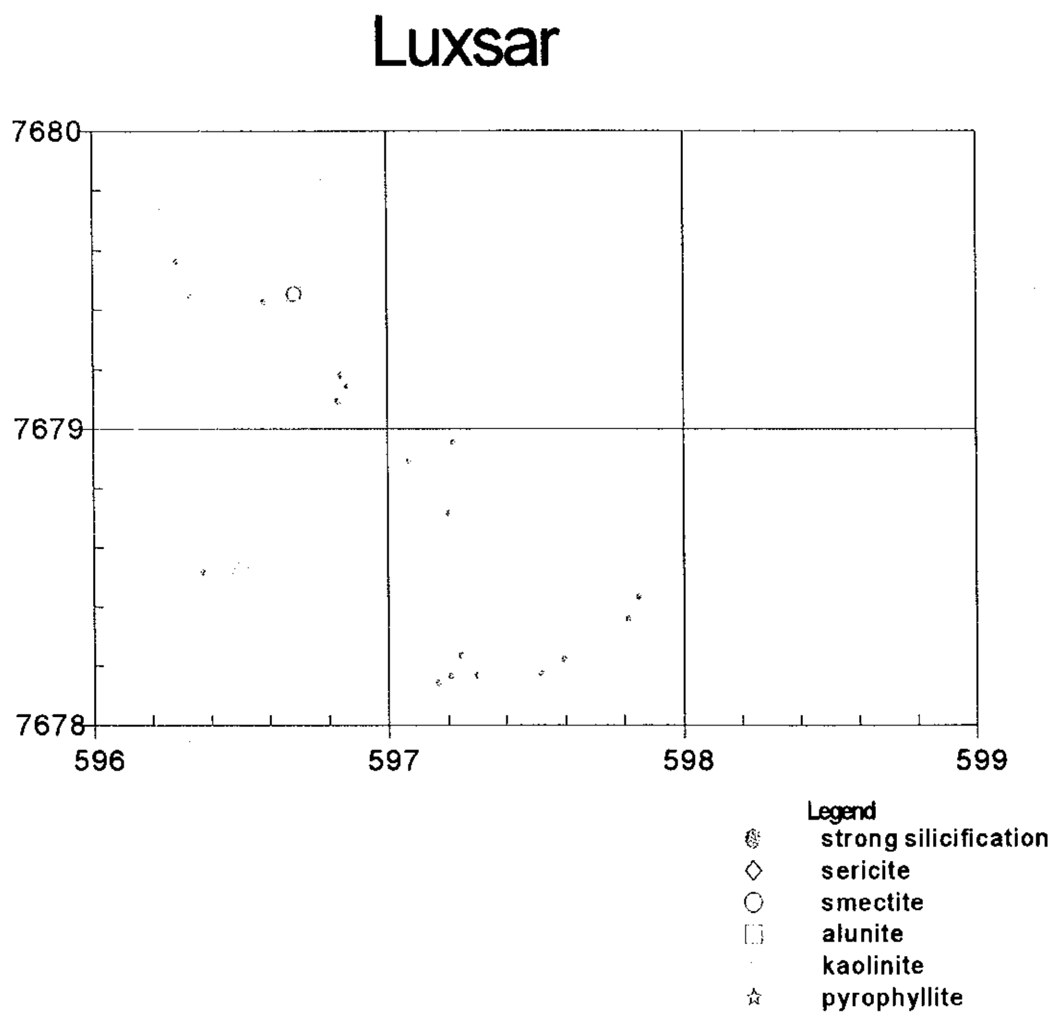


Fig.II-2-14 (2)Distribution Map of Alteration Minerals in the Luxsar District

according to the existing information.

The andesite domes are composed of gray pyroxene-hornblends andesite existing at least at two localities; the K-Ar dating of samples collected from the south-side dome indicate 5.55±0.09 Ma (No. 2011).

Faults, veins and fissures in the District trend NW-SE.

(2) Alteration

The hydrothermal alteration zones, biggest in the survey area, cover about 28.5 km^2. Hydrothermal alteration zones cover about 5.5 km^2, and extend from the northwest to southeast and farther eastward.

Silicification and agrgillization are observed; small-scale silicification zones are observed within extensive argillization zones. The north-side dome and its surroundings have undergone intensive hydrothermal brecciation.

Quartz, alunite, smectite and kaolinite are observable as the alteration minerals.

(3) Mineralization

Pyrite mineralization is observed at two localities; besides, manganese veinlets (No. 2182) have been ascertained at two localities.

(4) Assay of geochemical samples

Seventy-two rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, 2ppb, <2ppb, Ag: <0.5ppm, <0.5ppm, <0.5ppm, Cu: 4ppm, 87ppm, 27ppm, Pb: 6ppm, 68ppm, 18ppm, Zn: 9ppm, 176ppm, 45ppm, As: <5ppm, 74ppm, 18ppm, Sb: <5ppm, <5ppm, <5ppm, Hg: <1ppm, <1ppm, <1ppm, Mo: <1ppm, 12ppm, 3ppm, Ba: 38ppm, 1,411ppm, 924ppm, Sn: <5ppm, 8ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-14 (3).

Au: Two samples showed 2 ppb but all the others are under the detection limit.

Ag All the samples are under the detection limit.

Cu: All the samples are 87 ppm or less, showing no anomalies.

Pb: All the samples are 68 ppm or less, showing no anomalies.

Zn: All the samples are 176 ppm or less, showing no anomalies.

As: All the samples are 74 ppm or less, showing no anomalies.

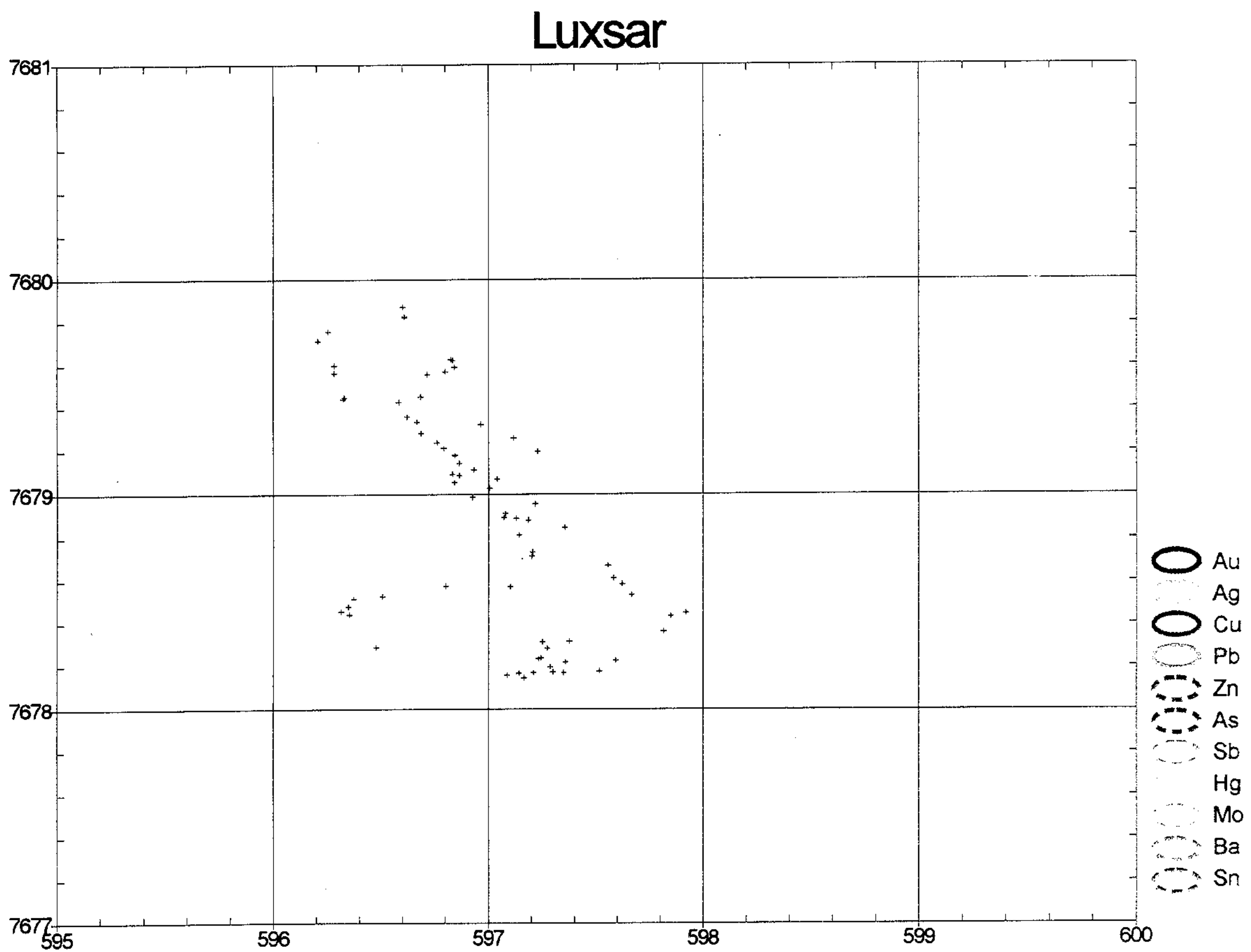


Fig.II-2-14 (3)Geochemical Anomaly Map of the Luxsar District

Sb: All the samples are under the detection limit.

Hg: All the samples are under the detection limit.

Mo: All the samples are 12 ppm or less, showing no anomalies.

Ba: Most samples range between 800 ppm and 1,500 ppm, showing no anomalous value.

Sn: The highest value is 8 ppm, while most samples are under the detection limit.

(5) Considerations

Although hydrothermal breccia is located around a dome, as the silicification is weak and there is no geochemical anomaly, the mineralization is probably weak or deep-seated.

2-15 Cachi Unu District(Figs.II-2-15,II-2-15(1 to 3))

(1) Geology

The District is underlain by the Cachi Unu startovolcanic rocks of the middle Miocene age, composed of pyroclastic rocks such as lapilli tuff and tuff breccia (volcanic breccia), as well as andesite and dacite lavas.

The andesite is dark gray- to light gray-colored two-pyroxene-hornblende andesite; the K-Ar dating of samples collected on the northwestern slope of the Cerro Millu Orkho indicates 9.67±0.13 Ma.

The dacite is grayish white- to gray-colored and dated as 10.9±0.7 Ma. in the existing information.

Although the dominant trend of faults, veins and fissures in the District is NW-SE some show the E-W trend.

(2) Alteration

Hydrothermal alteration zones cover about 1 km^2.

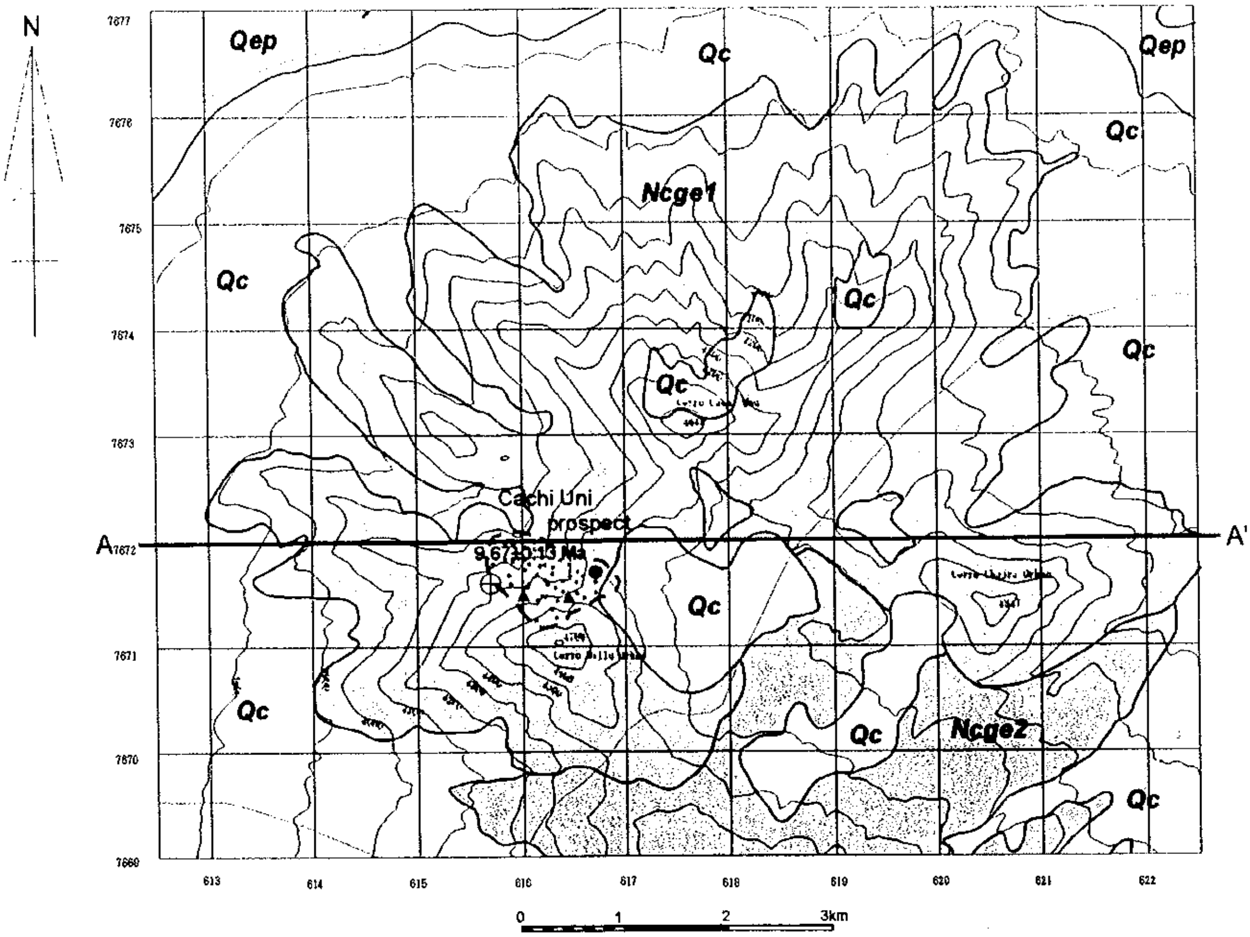
Small-scale silicification zones lie in argillization zones extending in the WNW-SES direction; the silicification zones are partly made up of hydrothermal breccia.

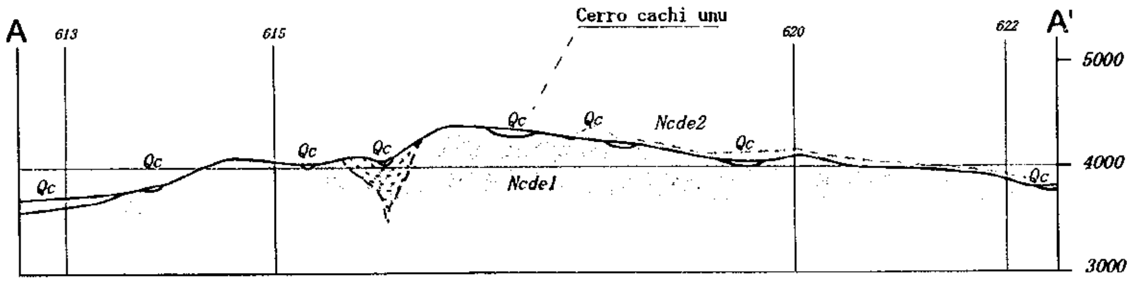
Quartz, kaolinite, alunite, smectite and pyrophyllite are observable as the alteration minerals.

(3) Mineralization

On the northern slope of the Cerro Millu Orkho, fissures accompanied by green copper and green copper dissemination, striking N80E and dipping 30 S, are observed in intensively sericitized lapilli tuff, where a small old mining site remains.

(4) Assay of geochemical samples





Legend

Qep	Saline, dep. Salf, ulexite and gypsun
Qc	Quaternery Alluvial, Colluvial, Terrace, Gracual and dep. Lacustrine deposits.
Ncge2	Chiguana2. Darkgray porphyritic andesite lavas stratovolcano.
Ncge1	Chiguana1. Statovolcano Angesite and Dacite lavas.

- Lineament
- Hydrothermal alteration zone
- Cu
- Pyrite

Fig. II-2-15 Geological Map of the Cachi Unu District

Cachi Unu

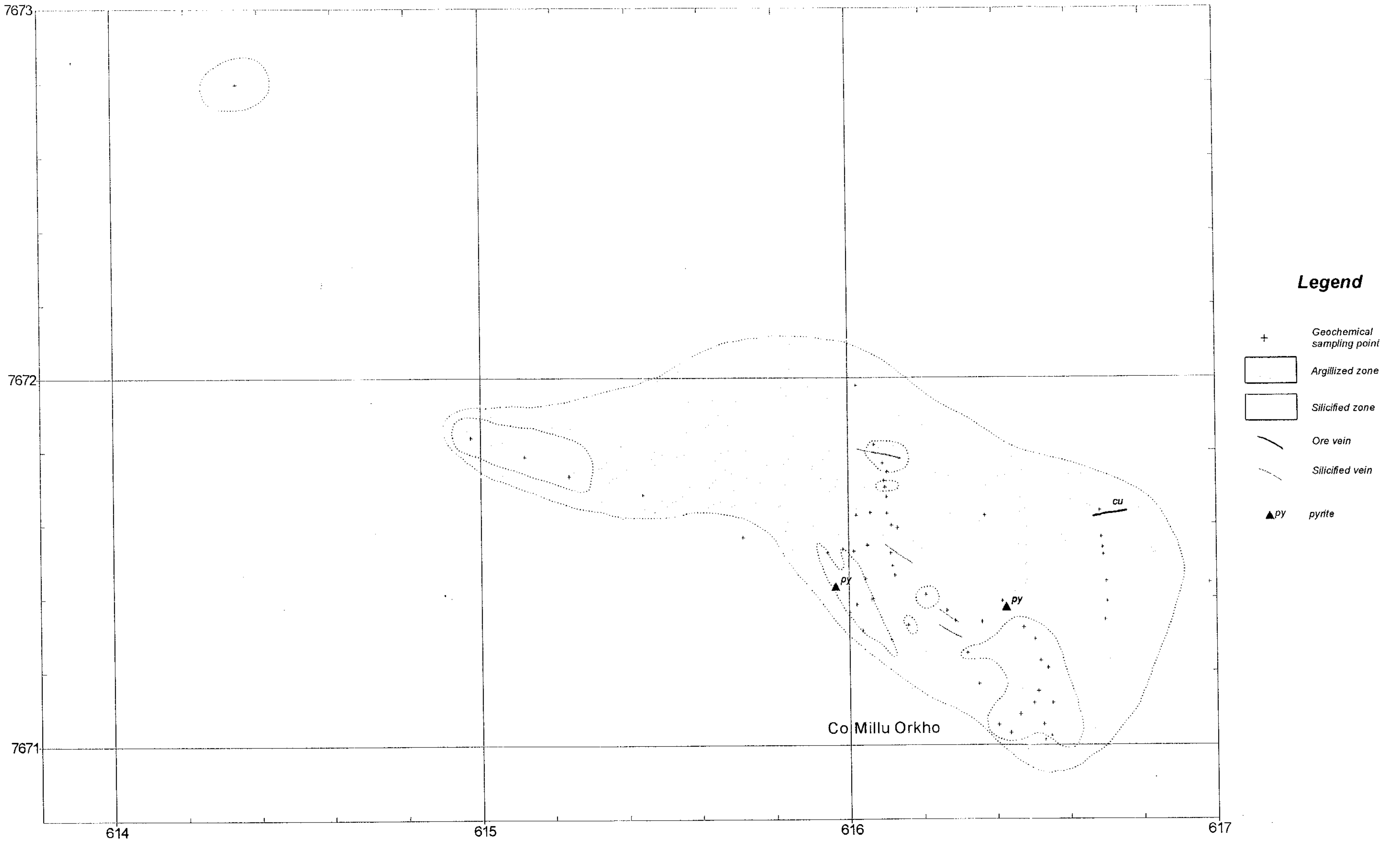


Fig.II-2-15 (1)Alteration Map of the Cachi Unu District

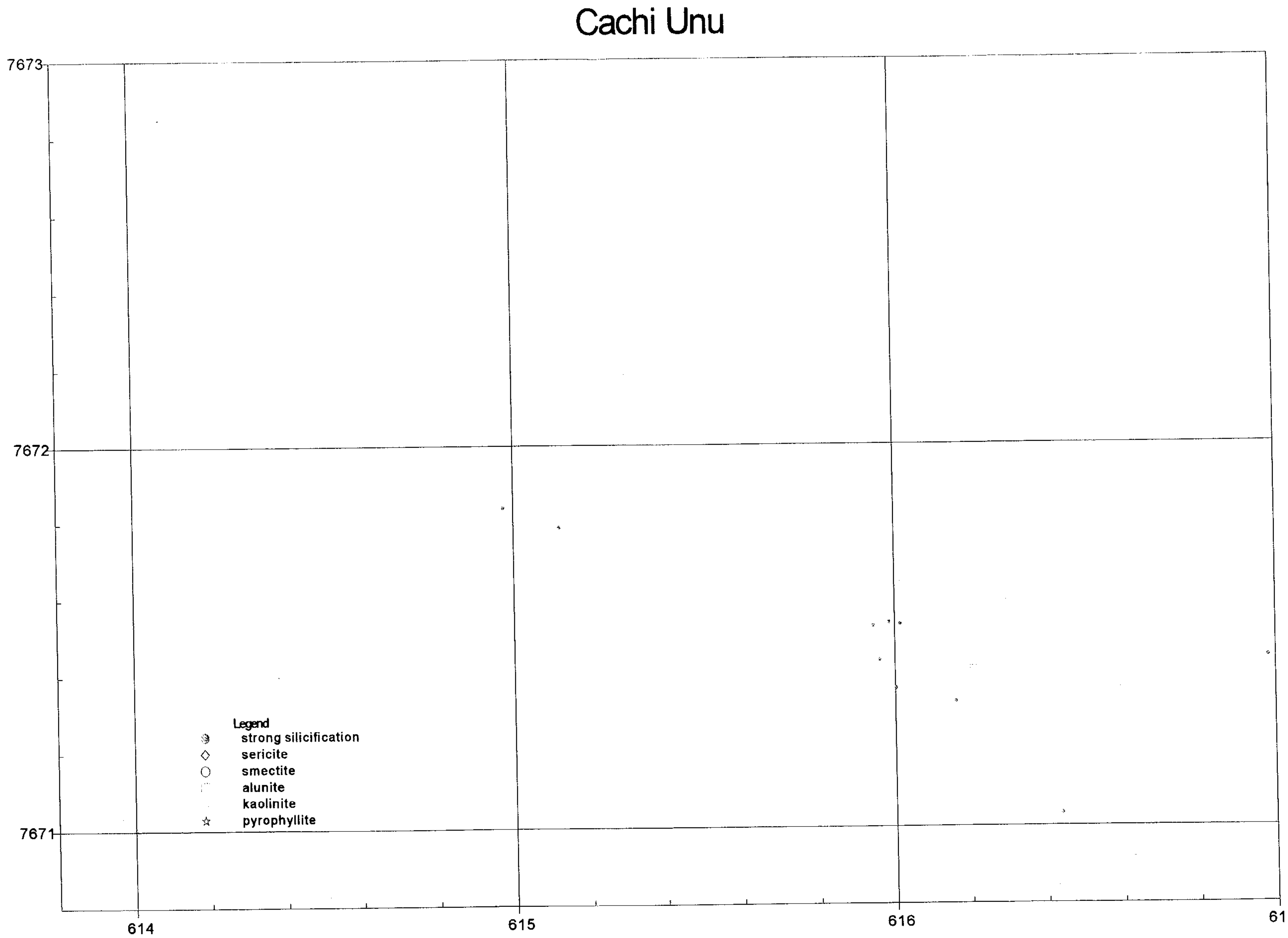


Fig.II-2-15 (2)Distribution Map of Alteration Minerals in the Cachi Unu District

Cachi Unu

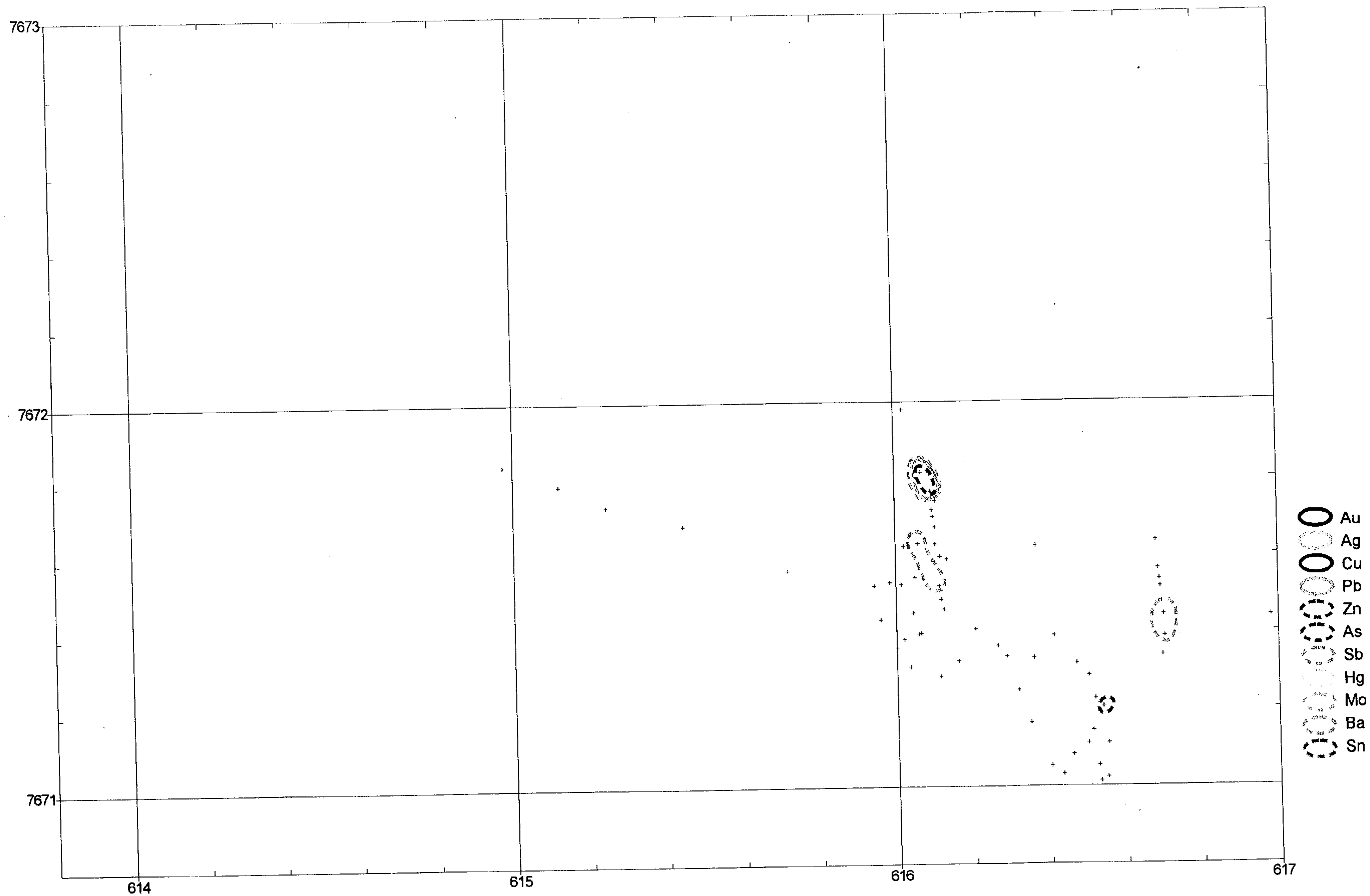


Fig.II-2-15 (3)Geochemical Anomaly Map of the Cachi Unu District

Sixty-six rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, 9ppb, <2ppb, Ag: <0.5ppm, 3.1ppm, <0.5ppm, Cu: 3ppm, 36ppm, 9ppm, Pb: <3ppm, 1,605ppm, 74ppm, Zn: 4ppm, 182ppm, 35ppm, As: <5ppm, 101ppm, 22ppm, Sb: <5ppm, 7ppm, <5ppm, Hg: <1ppm, <1ppm, <1ppm, Mo: <1ppm, 10ppm, 3ppm, Ba: 278ppm, 3,348ppm, 1,019ppm, Sn: <5ppm, 36ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-15 (3).

Au: Most of the samples are under the detection limit.

Ag: Except two samples that indicate 3.1 ppm and 1.2 ppm, all the samples are under the detection limit.

Cu: All the samples are 36 ppm or less, showing no anomalies.

Pb: Two adjoining samples show anomalous values of 400 ppm or higher.

Zn: All the samples indicate 182 ppm or less, showing no anomalies.

As: All the samples indicate 101 ppm or less, showing no anomalies.

Sb: Except two samples that show 7ppm, all are under the detection limit.

Hg: All the samples are under the detection limit.

Mo: All the samples are 10 ppm or less, showing no anomalies.

Ba: Anomaly zones showing 1,500 ppm or higher are found at three localities.

Sn: Anomaly portions showing 10 ppm or higher are found at two localities.

(5) Considerations

The mineralization of this district is presumed to be correspond to Bolivian type polymetallic silver- copper deposit (Type I B) or high-sulfidation epithermal type (Type IV). Probably the mineralization is weak or deep-seated, as the alteration and geochemical anomaly is not remarkable.

2-16 Sedilla District

2-16-1 Chascos Prospect(Figs.II-2-16,II-2-16(1 to 3))

(1) Geology

The Chascos composite stratovolcano of the late Miocene age lies in the Prospect, which is divisible into the Cerro Cordon Orkho in the north and Mt. Chascos in the south.

The northern part is underlain by pyroclastic rocks such as lapilli tuff and tuff breccia(volcanic breccia), as well as andesite lava and domes (or intrusive rocks).

The lapilli tuff and tuff breccia(volcanic breccia) are light brown- to reddish brown-colored

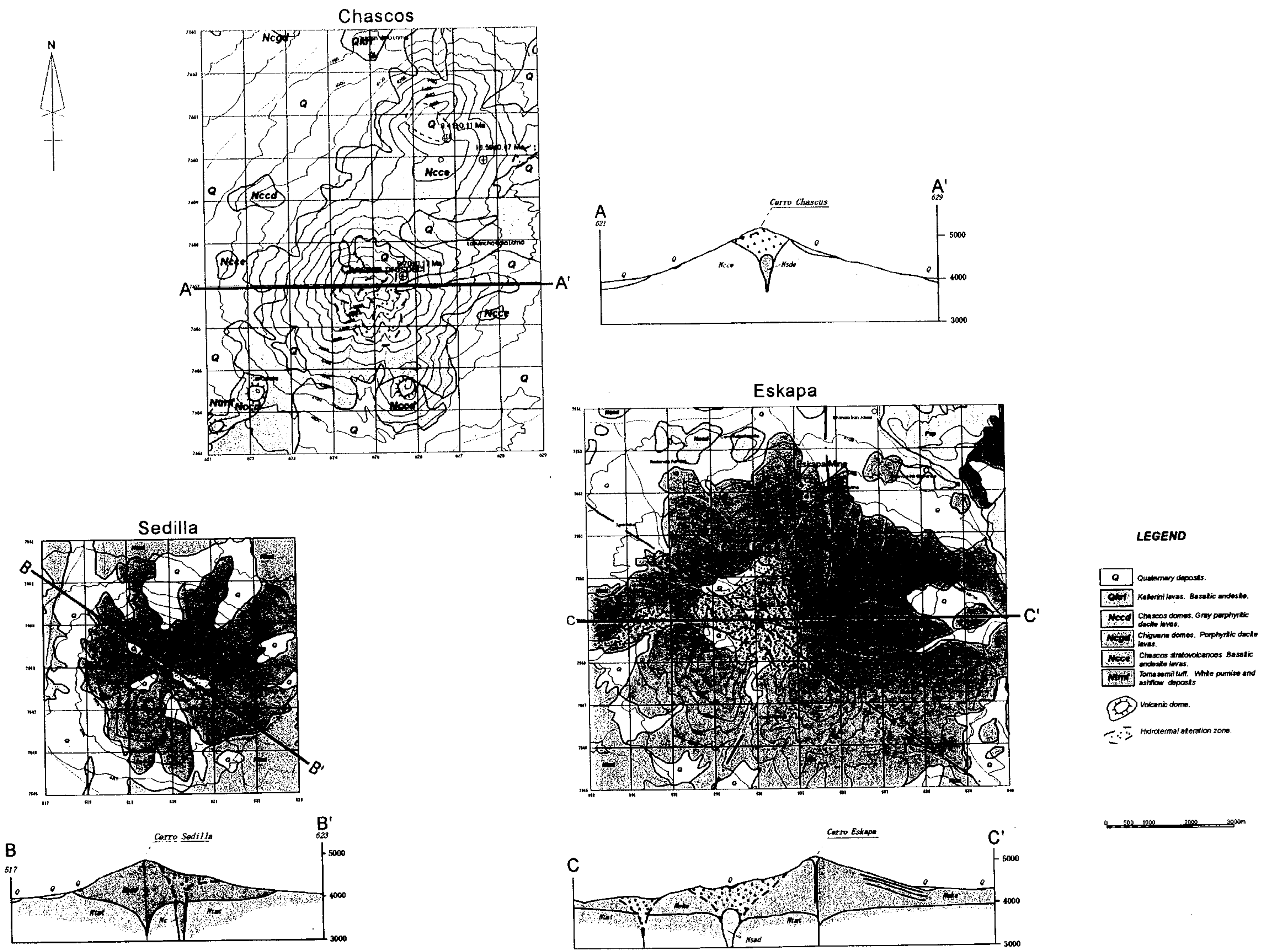


Fig.II-2-16 Geological Map of the Sedilla District

and include subrounded to subangular fragments up to a maximum diameter of 20 cm of reddish brown pyroxene andesite, dark gray hornblende andesite, etc.

The andesite consists of dark gray to gray, fine- to medium-grained hornblende-pyroxene andesite lava and gray, fine-grained biotite-hornblende-pyroxene andesite (dome?) which intrude into the former.

The K-Ar dating of the andesite lava indicates 10.59±0.47 Ma. (No. 4922)

The andesite dome lying in the NW-SE direction on top of the mountain is 0.6 km x 1.3 km in size. The K-Ar dating of the dome indicates 9.41±0.11 Ma. (No. 2170)

Biotite-hornblende andesite lava and its clastic rocks are distributed in Mt. Chascos in the south.

The K-Ar dating of andesite lava samples collected from the eastern slope indicates 9.70±0.17 Ma. (No. 3526) In the existing information, a sample of rhyolitic to dacitic lava (dome) taken from the southwestern slope shows 7.2±0.5 Ma.

No remarkable geologic structure has been discerned in the Prospect.

(2) Alteration

Hydrothermal alteration zones which cover approximately 1 km^2 lie in small scale on top of Mt. Chascos and at the east piedmont of the Cerro Cordon Orkho.

Silicification and argillization are observable but generally weak; silicification zones are present only in parts of argillization zones.

Quartz and alunite are observable as the alteration minerals.

(3) Mineralization

No indications of mineralization have been discerned except manganese oxides observed at Mt. Chascos, where an old pit remains.

(4) Assay of geochemical samples

Twenty-one rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, <2ppb, <2ppb, Ag: <0.5ppm, <0.5ppm, <0.5ppm, Cu: 6ppm, 34ppm, 14ppm, Pb: 3ppm, 18ppm, 13ppm, Zn: 12ppm, 147ppm, 46ppm, As: <5ppm, 403ppm, 32ppm, Sb: <5ppm, 34ppm, <5ppm, Hg: <1ppm, <1ppm, <1ppm, Mo: <1ppm, 6ppm, 2ppm, Ba: 389ppm, 1,342ppm, 995ppm, Sn: <5ppm, <5ppm, <5ppm.

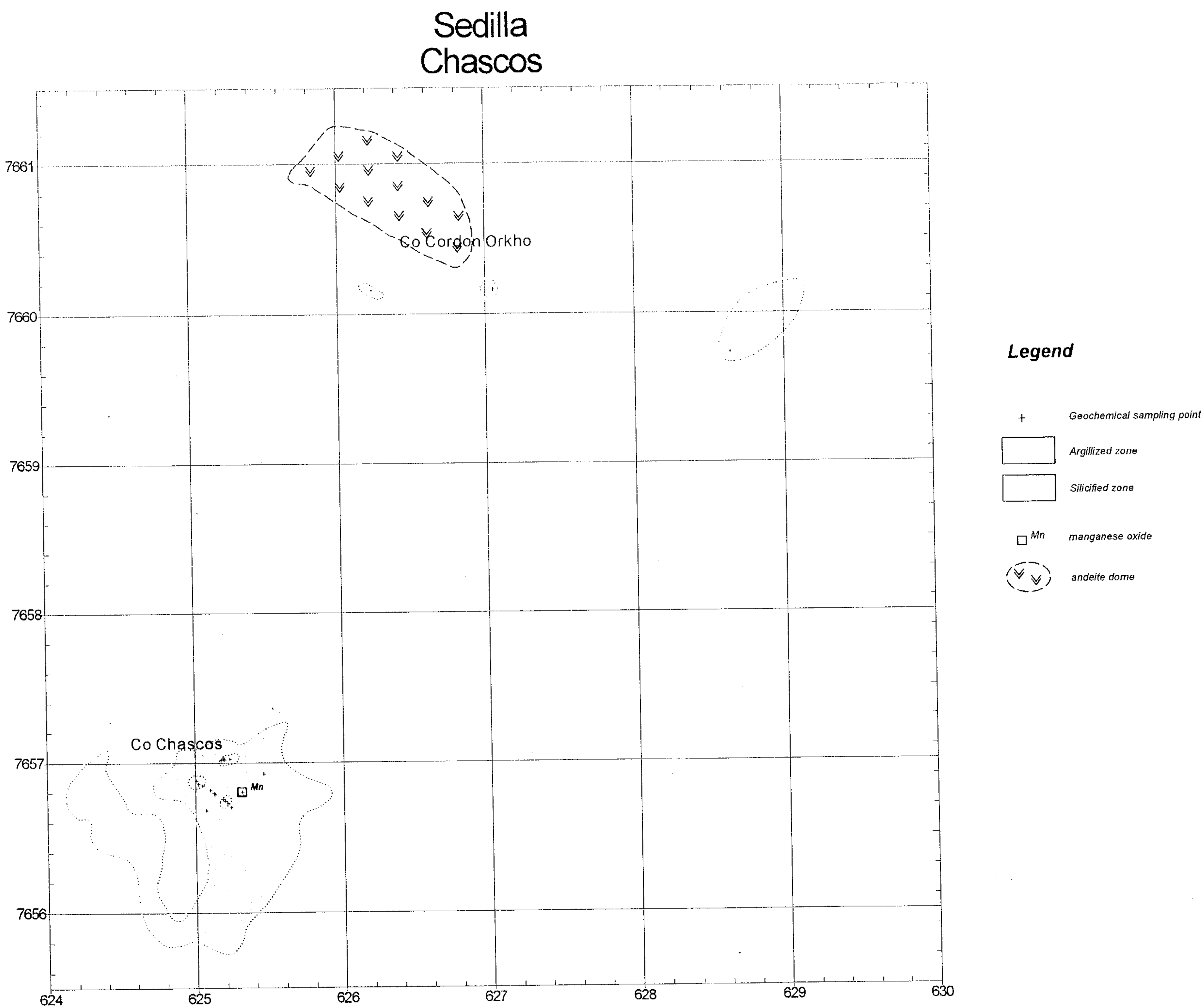


Fig.II-2-16 (1)Alteration Map of the Sedilla District(Chascos)

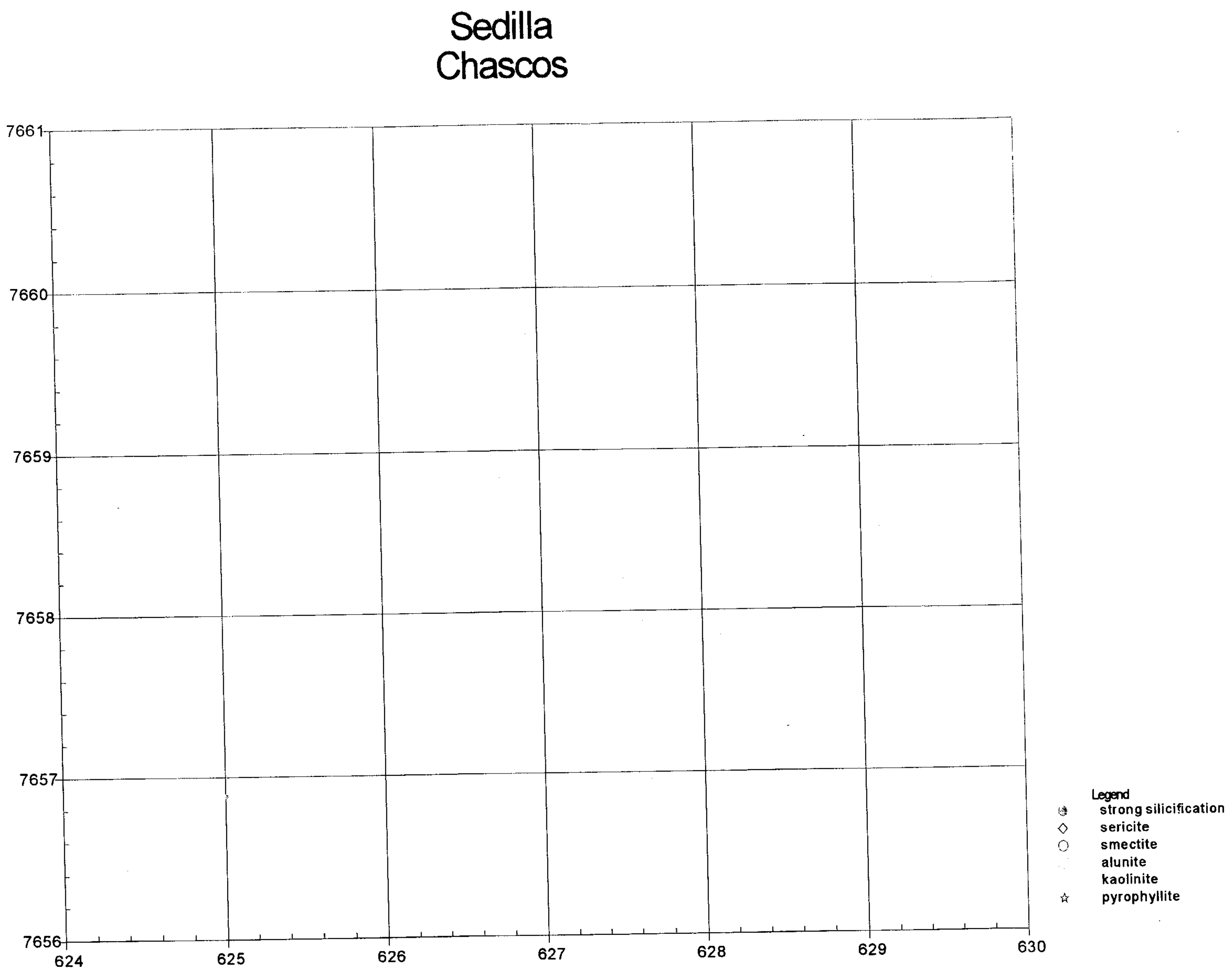


Fig.II-2-16 (2)Distribution Map of Alteration Minerals in the Sedilla District (Chascos)

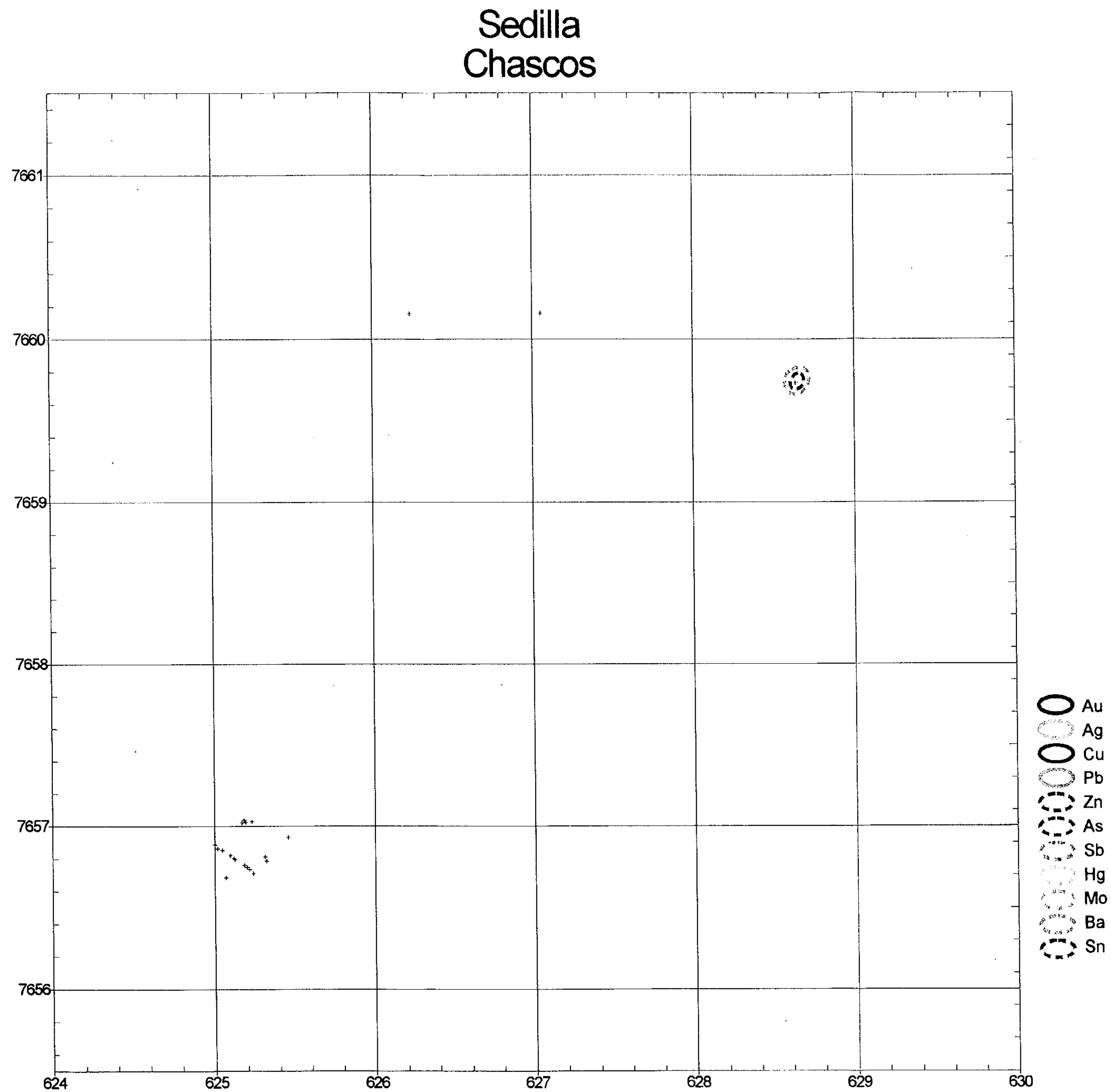


Fig.II-2-16 (3)Geochemical Anomaly Map of the Sedilla District (Chascos)

Geochemical anomalies of the respective elements are indicated in Fig. II-2-16 (3).

Au: All the samples are under the detection limit.

Ag: All the samples are under the detection limit.

Cu: All the samples are 34 ppm or less, showing no anomalies.

Pb: All the samples are 18 ppm or less, showing no anomalies.

Zn: All the samples are 147 ppm or less, showing no anomalies.

As: A sample taken from the alteration zone on the east piedmont of the Cerro Cordon Orkho indicates an anomalous value.

Sb: A sample taken from the east piedmont of the Cerro Cordon Orkho indicates an anomalous value.

Hg: All the samples are under the detection limit.

Mo: All the samples are 6 ppm or less, showing no anomalies.

Ba: All the samples are 1,342 ppm or less, showing no anomalies.

Sn: All the samples are under the detection limit.

(5) Considerations

The alteration is weak and only one geochemical anomaly portion of arsenic and antimony was detected in chascos prospect. The mineralization will be weak or deep-seated if it exists, as there is no hydrothermal alteration around a dome.

2-16-2 Sedilla Prospect(Figs.II-2-16,II-2-16(4 to 6))

(1) Geology

The Prospect is underlain by pyroclastic rocks such as tuff, lapilli tuff and tuff breccia (volcanic breccia), as well as andesite lava and dacityc lava, which constitute the Sedilla stratovolcano of the late Miocene age.

The pyroclastic rocks include medium to intensively argillized and silicified andesite pebbles up to 10 cm in size.

The dacite is of porphyritic texture and includes biotite and quartz phenocrysts. The K-Ar dating as recorded in the existing information indicates 6.9±0.5 Ma.

Faults, veins and fissures in the Prospect trend NNE-SSW and NNW-SSE.

(2) Alteration

Hydrothermal alteration zones have the E-W trend and cover about 1 km^2.

Generally weak silicification and argillization are observed; medium-grade silicification zones trending E-W are discerned within extensive argillization zones.

Small-scale hydrothermal breccia lies near the east-end of the alteration zone.

Sedilla
Sedilla

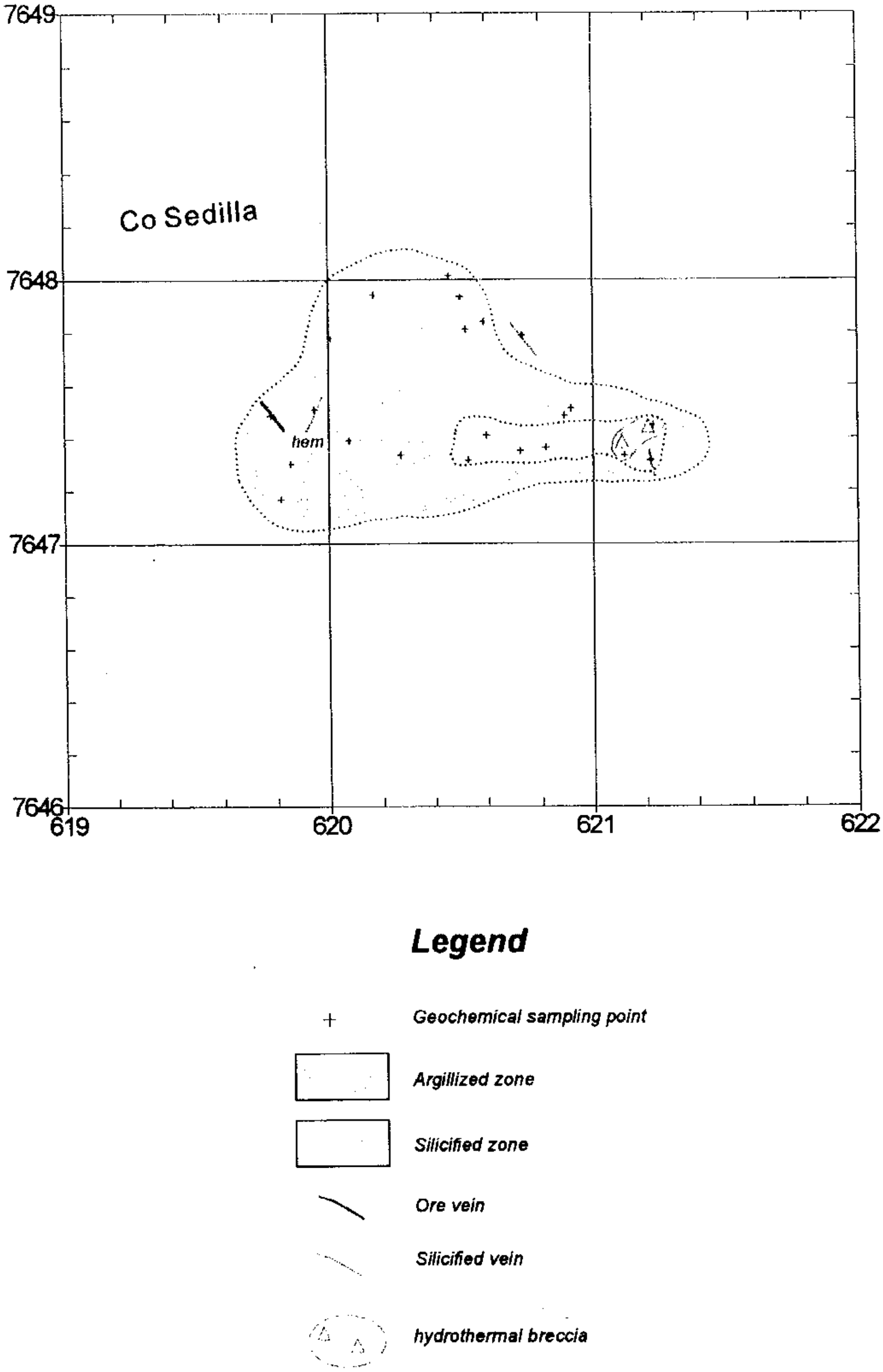


Fig.II-2-16 (4)Alteration Map of the Sedilla District (Sedilla)

Sedilla
Sedilla

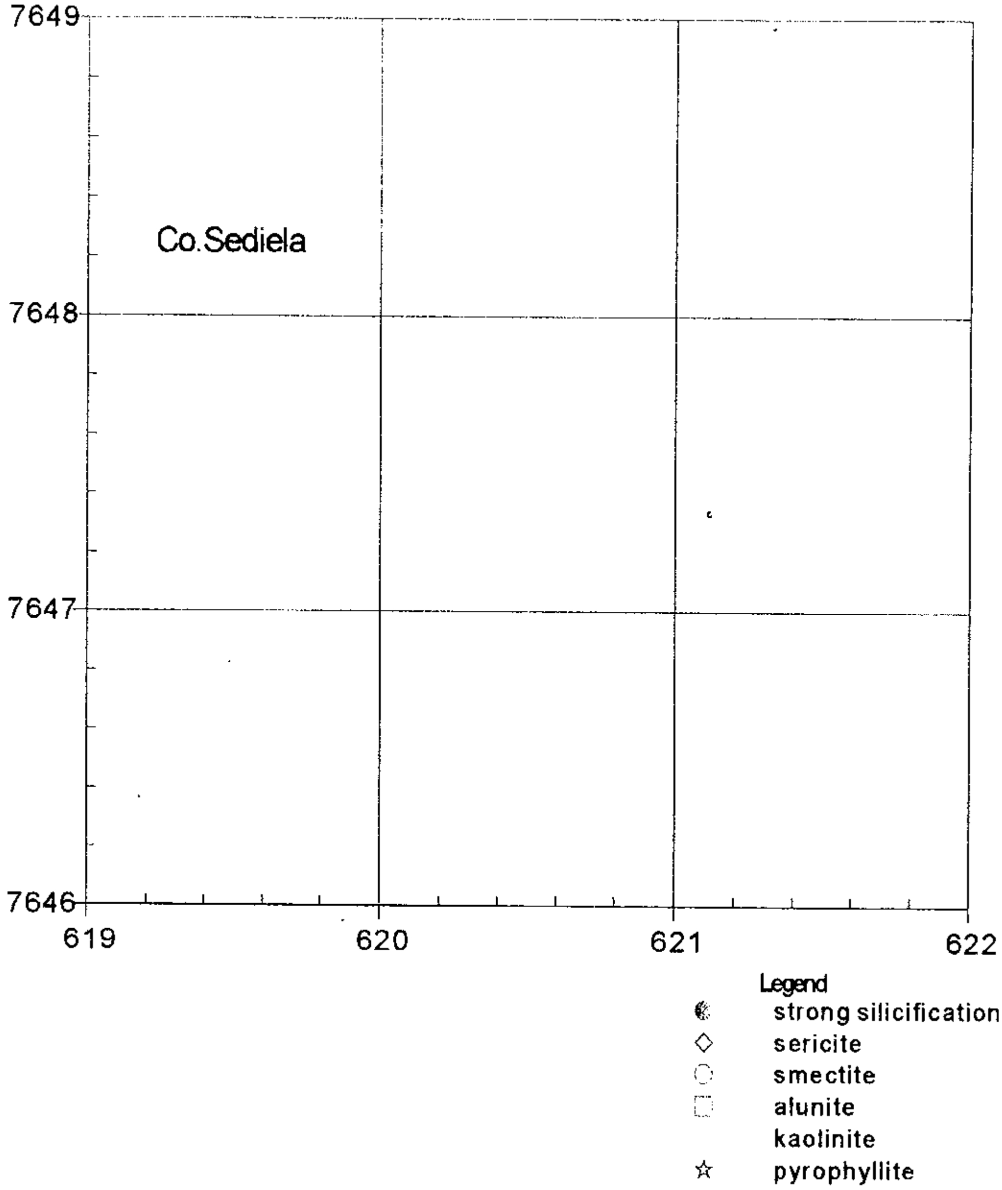


Fig.II-2-16 (5)Distribution Map of Alteration Minerals in the Sedilla District (Sedilla)

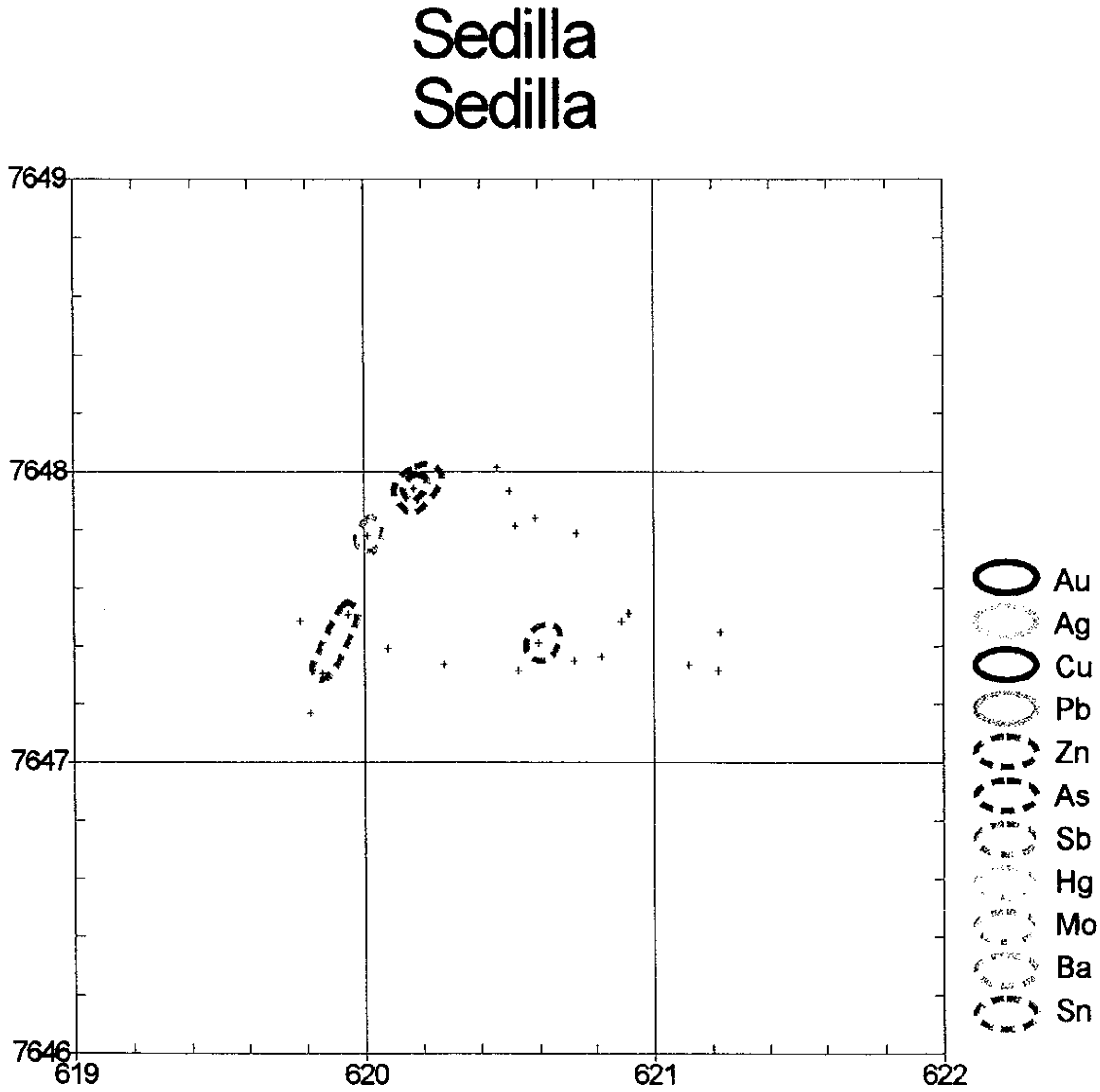


Fig.II-2-16 (6)Geochemical Anomaly Map of the Sedilla District (Sedilla)

Quartz and alunite are observable as the alteration minerals.

(3) Mineralization

Although no marked indications of mineralization is discernible, limonite -- presumably deriving from oxidation of hematite and pyrite – is partly recognizable.

(4) Assay of geochemical samples

Twenty-four rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance) are as follows:

Au: <2ppb, 3ppb, <2ppb, Ag: <0.5ppm, <0.5 ppm, <0.5ppm, Cu: 5ppm, 17ppm, 11ppm, Pb: 14ppm, 396ppm, 50ppm, Zn: 4ppm, 171ppm, 40ppm, As: 7ppm, 214ppm, 55ppm, Sb: <5ppm, 21ppm, <5ppm, Hg: <1ppm, <1ppm, <1ppm, Mo: <1ppm, 8ppm, 3ppm, Ba: 187ppm, 1,785ppm, 838ppm, Sn: <5ppm, 40ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-16 (6).

Au: All the samples but one that shows 3 ppb are under the detection limit.

Ag: All the samples are under the detection limit.

Cu: All the samples are 20 ppm or less.

Pb: A sample shows 396 ppm but none shows an anomalous value.

Zn: Two samples show values between 100 and 200 ppm but all are lower than the anomalous value.

As: Two samples show anomalous values of 500 ppm or higher.

Sb: A sample shows an anomalous value of 21 ppm.

Hg: All the samples are under the detection limit.

Mo: All the samples are 10 ppm or less.

Ba: All the samples are lower than the anomalous value the highest being 1,785 ppm.

Sn: Three samples show anomalous values of 10 ppm or higher.

(5) Considerations

The mineralization in Sedilla prospect correspond to epithermal gold- silver- lead- zinc deposit (Type II) presumed from the presence of tin. Probably it is weak or deep-seated, as the alteration and geochemical anomaly are weak.

2-16-3 Eskapa Mine(Figs.II-2-16,II-2-16(7 to 9))

The once operating Eskapa Mine, a.k.a., Cova Khuchu Mine, lies on the norhtern slope of the Eskapa volcanic body, as well as the Cuidado Mine. At the latter mine, a vertical shaft remains in the hydrothermal alteration zone on the intensively eroded western slope.

The Eskapa Mine is a small-scale, vein-type copper deposit -- two network-like vein zones trending N-S -- discovered and operated during the Colonial Times and also exploited in minor scale by a nearby mining cooperative between 1968 and 71.

The Cuidado Mine is an ore deposit of precious metals, mainly silver, explored in small scales in the Colonial Times. In the latter half of the 19th Century, preparation for devepment was undertaken by a Chilean company. In 1995, geological and geochemcial surveys were conducted under German assistance. Afterwards, a Canadian exploration company, SAMEX, performed geological survey, chemical analysis, IP survey, drilling exploration (9 boreholes in 1999). At the time of the Phase-II survey, IP survey by a joint venture of the SAMEX and International Chalice Resources, Inc. was ongoing.

(1) Geology

The Co. Eskapa stratovolcanic rocks of late Miocene age are widespread in the Eskapa survey area.

The Stratovolcano is composed of pyroclastic rocks such as tuff, lapilli tuff and tuff breccia(volcanic breccia), as well as andesite and dacite lavas and intrusive rocks(?).

The andesite, observed at the Eskapa Mine on the northern slope, is autobrecciated coarse-grained biotite andesite, weakly propylitized.

The K-Ar dating of the northern part of the mine indicates 6.3±0.1 Ma. (late Miocene age), according to the existing information.

The dacite, in its fresh part, is light gray-colored and accompanied by biotite, hornblende and quartz phenocrysts while, in the parts subjected to alteration, it is white- to grayish white-colored and biotite is replaced by muscovite.

The pyroclastic rocks, distributed in the southwestern part of the Eskapa survey area, are dacitic, include subangular to subrounded dacite, biotite andesite, rhyolite and siliceous pebbles up to a maximum size of 70 cm, and have undergone hydrothermal alteration and brecciation of various grades.

Most of faults, veins and fissures in the Eskapa Mine trend N-S, while there are some fissures with the NE-SW trend intersecting the former. At the Cuidado Mine, those with the NW-SE trend are discerned.

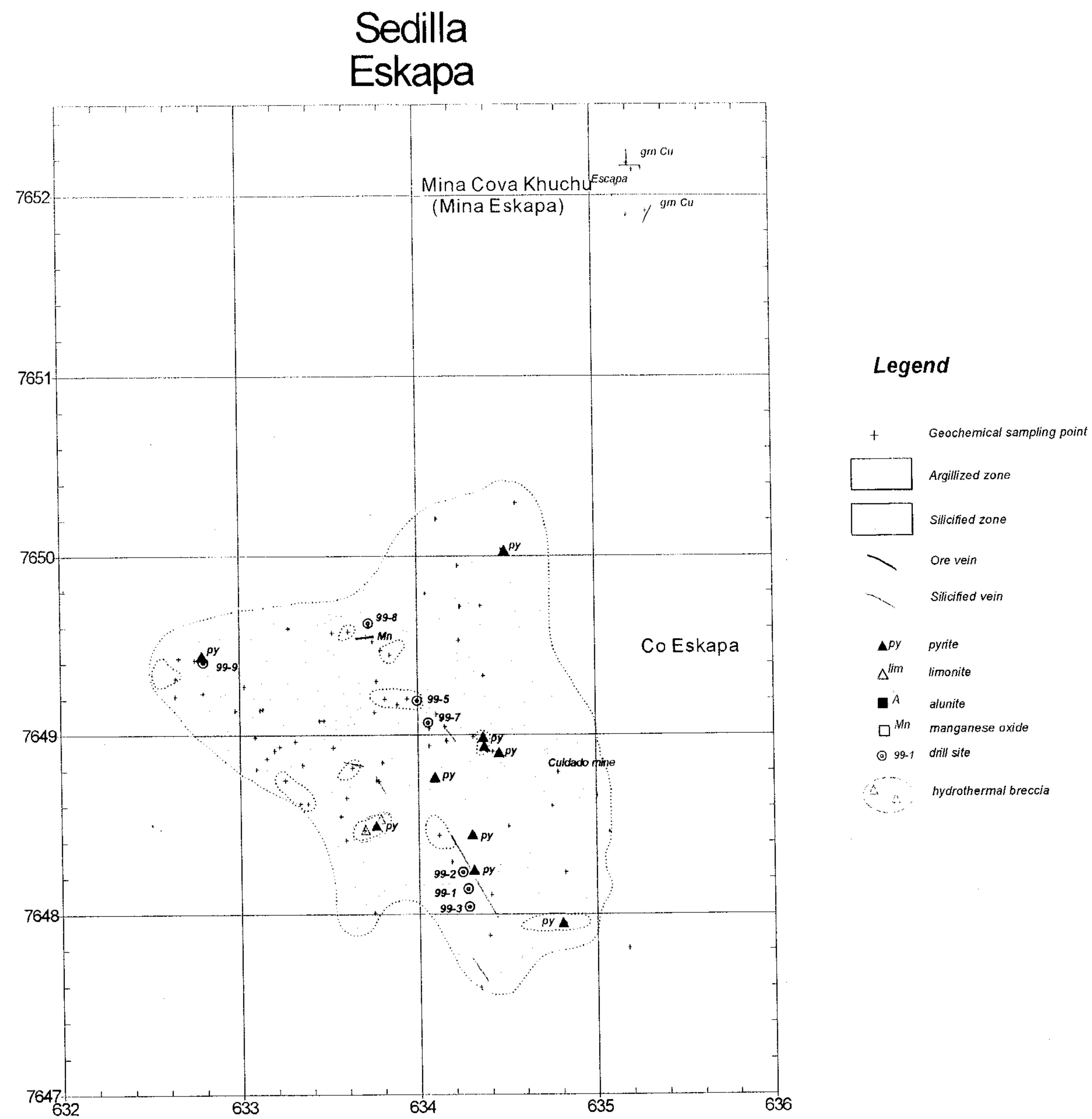


Fig.II-2-16 (7)Alteration Map of the Sedilla District (Eskapa)

(2) Alteration

The hydrothermal alteration zones cover approximately 4.5 km^2 besides, small-scale alteration zones are present further west.

Silicification, argillization and propylitization(?) are observed.

At the Eskapa Mine, only weak propylitization is observable in a part of andesite .

At the Cuidado Mine, argilliazation are widespread, in which small-scale silicification zones are observed. Some parts of hydrothermal breccia take the vein form striking N30~35W.

Quartz, smectite, sericite and kaolinite are observable as the alteration minerals.

The K-Ar dating of sericitized dacite indicates 5.93±0.19 Ma. (N0.2196)

(3) Mineralization

There remain old mining sites, pits and shafts since the Colonial Time at the Eskapa Mine. An old stope is in the N-S direction, about 10 m in width and 100 m in extension.

The ore deposit is a vein-type oxidic copper deposit in andesite lava, which fills fissures mainly striking N20E ~ NS and dipping 50~60E and also striking N50~60E and dipping 50~60S. The veins are 3 cm in the maximum width, averaging 2 to 3 mm. The mineralization zone is approximately 50 m wide and 500 m long.

Main alteration minerals are tenorite, chrysocolla and a subordinate amount of malachite.

White to light green-colored, brittle calcite is partially present as the gangue minerals, which fills large gaps of breccia and boulders.

In the copper vein (No. 2012), silver grading 15.5 g/t has been detected in addition to copper grading 6.04%.

At the Cuidado Mine, pyrite dissemination in the surface alteration zones is observed in various places (No.3259), and a barite vein, about 1.5 m wide, striking N30W and shaply dipping is ascertained at the contact between hydrothermal breccia and dacite (No.3262). In the alteration zone, there remain old shafts of the Colonial Times at several localities, while galena and pyrite ores are found in the waste.

A hydrothermal breccia vein, rich in limonite, striking N80W and dipping 75N (No. 2858) contains silver of 46.5 g/t and trace amounts of other elements.

(4) Assay of geochemical samples

Ninety-three rock-chip samples were collected in this area.

The minimum, maximum and average assay values by elements (in the order of appearance)

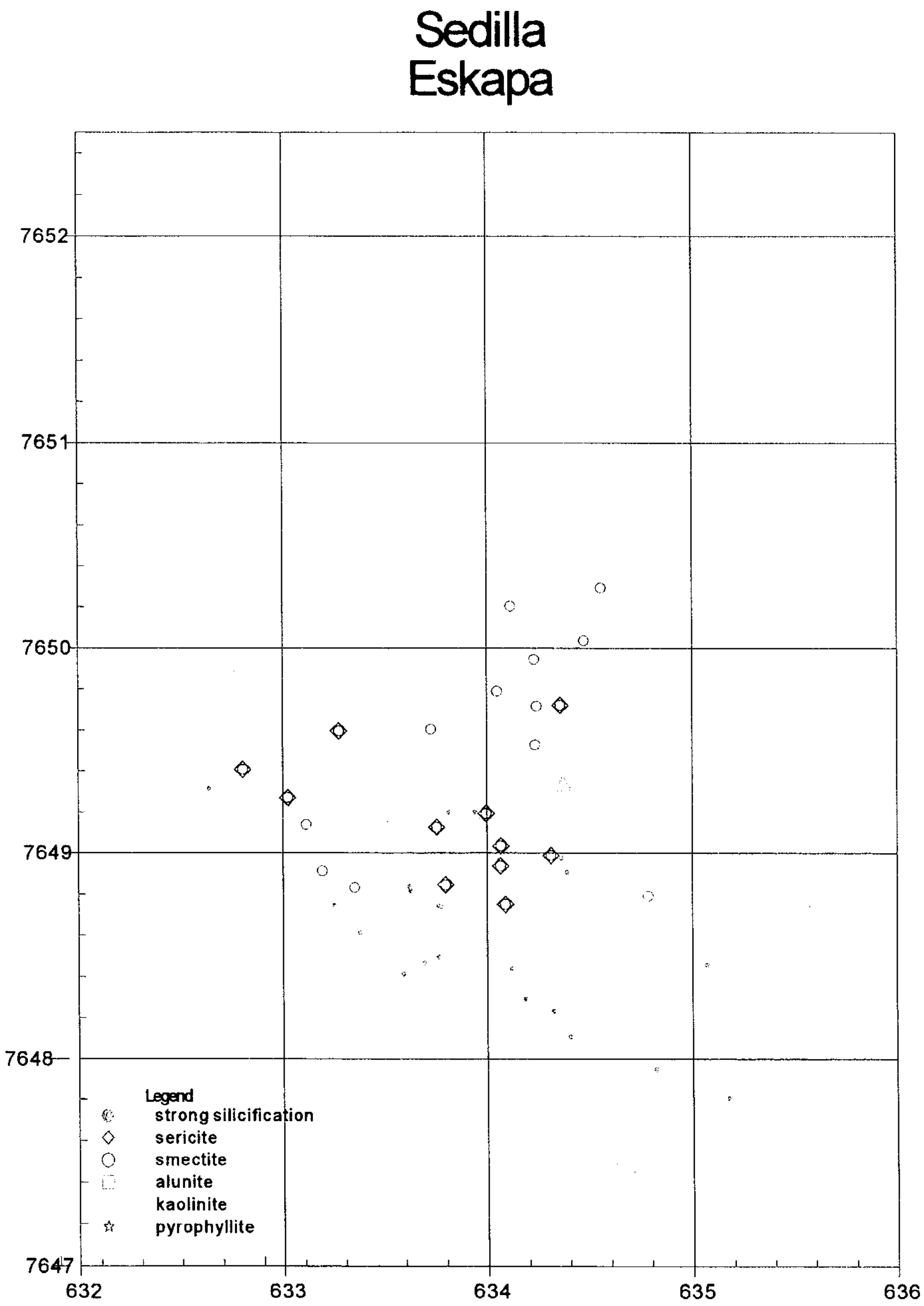


Fig.II-2-16 (8)Distribution Map of Alteration Minerals in the Sedilla District (Eskapa)

are as follows:

Au: <2ppb, 18ppb, <2ppb, Ag: <0.5ppm, 290ppm, 6.9ppm, Cu: <2ppm, 1,843ppm, 47ppm, Pb: 9ppm, 1,217ppm, 56ppm, Zn: 3ppm, 1,896ppm, 64ppm, As: <5ppm, 1,243ppm, 89ppm, Sb: <5ppm, 5,891ppm, 138ppm, Hg: <1ppm, 14.6ppm, <1ppm, Mo: <1ppm, 60ppm, 4ppm, Ba: 207ppm, 5,197ppm, 1,247ppm, Sn: <5ppm, 11ppm, <5ppm.

Geochemical anomalies of the respective elements are indicated in Fig. II-2-16 (9).

Au: The highest analysis value being 18 ppb, most of the samples are under the detection limit.

Ag: Three samples show 30 ppm or higher but most of the samples are under the detection limit.

Cu: Two samples show anomalous values of 90 ppm or higher.

Pb: Three samples show anomalous values of 400 ppm or higher.

Zn: Two samples show anomalous values of 230 ppm or higher.

As: Samples showing anomalous values of 140 ppm or higher are spotted at nine localities in the hydrothermal alteration zone.

Sb: Anomalous portions indicate max. 5,891 ppm, which are concentrated in several localities in the hydrothermal alteration zone.

Hg: Three samples from two localities show 2 ppm or higher but all the others are under the detection limit.

Mo: A sample shows an anomalous value of 40 ppm or higher.

Ba: Anomalous portions showing 1,500 ppm or higher are concentrated in the central part of the hydrothermal alteration zone.

Sn: A sample shows 10 ppm or higher but most samples are under the detection limit.

(5) Considerations

A neutral-type alteration zone is widely distributed in Eskapa prospect, and ore deposit is expected in shallow portion.

The mineralization appears to correspond to epithermal gold- silver- lead- zinc deposit (Type II) from the presence of tin and silver- lead anomalies. It is also possible the mineralization of the area correspond to upper part of porphyry type mineralization from the presence of neutral alteration.

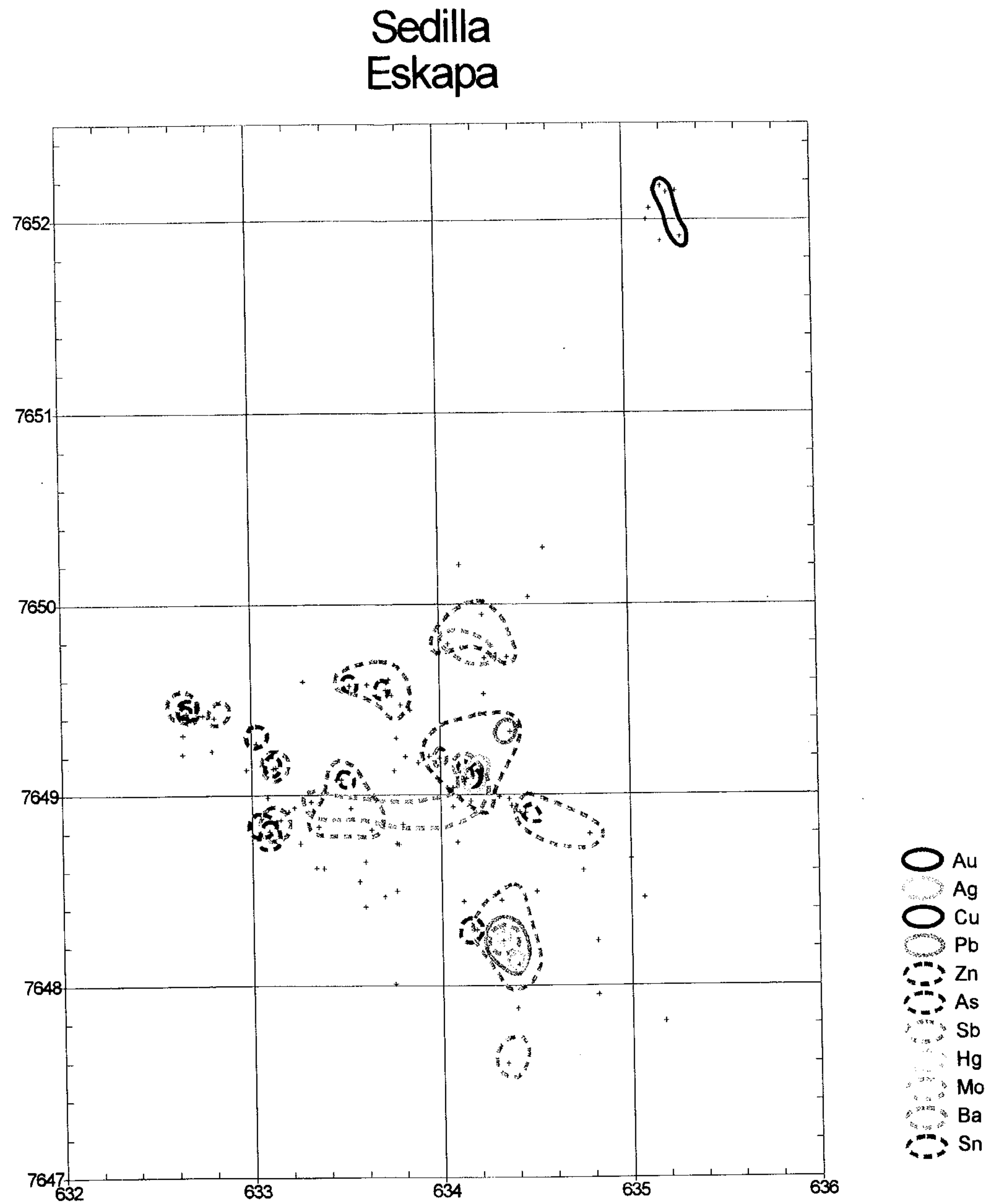


Fig.II-2-16 (9)Geochemical Anomaly Map of the Sedilla District (Eskapa)

Chapter 3 Geochemical Survey of Sstream Sediments

3-1 Analysis Method

The assay values of 48 elements of the stream sediment samples were analyzed by means of the descriptive statistics, correlation matrix calculation and factor analysis using the SPSS statistical analysis package application. 2,003 data were used for the statistical analysis. In case an assay value of an element was less than detection limit, it was replaced by a value equivalent to 1/2 of the detection limit of the element concerned. Se and W were excluded from the statistical analysis because these elements in all the samples are lower than the detection limits and, therefore, the variance comes to zero.

The descriptive statistical values are indicated in Table II-3-1, the inter-element correlation matrices in Table II-3-2, and the factor loadings of each elements by the factor analysis up to the twelfth factor in Table II-3-3, respectively.

3-2 Results of Analysis and Considerations

Elements whose loadings for each factor are 0.4 or higher are as follows:

First Factor : Ca, Co, Cr, Fe, Ga. Mg, Ni, P, Sc, Ti, V and Zn
Second factor : Al, Ba, Be, Ca, Ga, K, Mg, Na, Rb, Sc, Sr, Y and Zr
Third factor : Ag, Cd, Mn, Pb, Sb and Zn
Fourth factor : Ge, Nb, Sn and Y
Fifth factor : Ce, La, Th, Ti and Y
Sixth factor : As, B and S
Seventh factor : In, Mn and Mo
Eighth factor : Li and U
Ninth factor : P and Te
Tenth factor : Cu
Eleventh factor : Au and Te
Twelfth factor : Bi

In the light of the above combinations of factors, the third factor is considered to be the one related to the mineralization in the area.

The third factor's score distribution is demonstrated in Figs. II-3-1(1) and (2). The high score zones of the third factor are found in the Sonia Susana District and in the Chinchilhuma Prospect of the Panizo District.

Table II-3-1 Descriptive Statistics of Stream Sediments

Element	Mean	Std. Deviation	Analysis N
Au	5.6	59.616	1971
Ag	0.38	0.718	1971
Al	6.28	2.541	1971
As	19.2	76.431	1971
B	8.4	29.333	1971
Ba	833.1	479.563	1971
Be	1.6	0.682	1971
Bi	2.5	0.172	1971
Ca	2.104	1.308	1971
Cd	0.6	0.518	1971
Ce	87.1	56.782	1971
Co	14.9	9.096	1971
Cr	72.0	68.042	1971
Cu	34.9	128.120	1971
Fe	6.405	5.105	1971
Ga	16.2	7.675	1971
Ge	1.2	0.737	1971
Hg	0.6	0.712	1971
In	1.0	0.197	1971
K	1.948	0.943	1971
La	47.1	32.439	1971
Li	30.2	21.132	1971
Mg	1.077	0.670	1971
Mn	1049.2	817.447	1971
Mo	1.5	2.076	1971
Na	1.834	0.973	1971
Nb	17.6	13.718	1971
Ni	20.9	13.670	1971
P	0.0993	0.047	1971
Pb	33.6	76.028	1971
Rb	74.4	35.689	1971
S	0.096	0.284	1971
Sb	2.8	2.070	1971
Sc	8.6	4.385	1971
Sn	3.4	2.016	1971
Sr	500.7	328.239	1971
Ta	1.0	0.298	1971
Te	2.5	0.079	1971
Th	11.3	11.243	1971
Ti	7657.0	6302.493	1971
Tl	2.6	0.750	1971
U	2.8	1.151	1971
V	205.9	197.204	1971
Y	13.5	5.759	1971
Zn	156.4	129.847	1971
Zr	88.0	43.792	1971

Table II-3-2 Correlation Matrix of Stream Sediments (1)

	Au	Ag	Al	As	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cu	Fe	Ga	Ge	Hg
Au	1.000	0.008	0.008	0.000	0.002	0.009	0.028	−0.003	0.055	0.002	0.023	0.088	0.152	0.018	0.079	0.058	0.020	0.010
Ag	0.008	1.000	−0.060	0.068	−0.002	0.162	−0.042	−0.008	−0.012	0.481	−0.063	0.001	−0.094	0.113	−0.016	−0.114	−0.048	0.245
Al	0.008	−0.060	1.000	−0.019	−0.108	0.667	0.734	0.007	0.505	−0.168	0.220	−0.086	0.077	0.039	−0.100	0.723	0.008	−0.086
As	0.000	0.068	−0.019	1.000	0.472	−0.022	−0.062	−0.002	0.129	0.032	−0.084	−0.052	−0.074	0.014	−0.043	−0.067	0.043	−0.012
B	0.002	−0.002	−0.108	0.472	1.000	−0.127	−0.123	−0.002	0.141	0.021	−0.125	−0.057	−0.089	0.001	−0.081	−0.129	0.104	−0.007
Ba	0.009	0.162	0.667	−0.022	−0.127	1.000	0.485	−0.011	0.296	−0.105	0.151	−0.094	0.084	0.079	−0.091	0.432	−0.088	−0.083
Be	0.028	−0.042	0.734	−0.062	−0.123	0.485	1.000	−0.026	0.288	−0.113	0.281	−0.095	0.136	0.034	−0.066	0.605	0.295	−0.074
Bi	−0.003	−0.008	0.007	−0.002	−0.002	−0.011	−0.026	1.000	0.007	−0.004	0.004	0.045	0.013	0.003	0.054	0.024	−0.012	−0.006
Ca	0.055	−0.012	0.505	0.129	0.141	0.296	0.288	0.007	1.000	−0.004	0.184	0.211	0.308	0.045	0.116	0.492	−0.024	0.030
Cd	0.002	0.481	−0.168	0.032	0.021	−0.105	−0.113	−0.004	−0.004	1.000	−0.023	0.055	−0.031	0.008	0.026	−0.101	−0.002	0.118
Ce	0.023	−0.063	0.220	−0.084	−0.125	0.151	0.281	0.004	0.184	−0.023	1.000	0.271	0.418	−0.026	0.534	0.559	0.279	0.270
Co	0.088	0.001	−0.086	−0.052	−0.057	−0.094	−0.095	0.045	0.211	0.055	0.271	1.000	0.659	0.040	0.815	0.339	0.049	0.079
Cr	0.152	−0.094	0.077	−0.074	−0.089	0.084	0.136	0.013	0.308	−0.031	0.418	0.659	1.000	0.033	0.704	0.516	0.109	0.267
Cu	0.018	0.113	0.039	0.014	0.001	0.079	0.034	0.003	0.045	0.008	−0.026	0.040	0.033	1.000	0.014	0.013	−0.028	−0.003
Fe	0.079	−0.016	−0.100	−0.043	−0.081	−0.091	−0.066	0.054	0.116	0.026	0.534	0.815	0.704	0.014	1.000	0.499	0.199	0.399
Ga	0.058	−0.114	0.723	−0.067	−0.129	0.432	0.605	0.024	0.492	−0.101	0.559	0.339	0.516	0.013	0.499	1.000	0.208	0.236
Ge	0.020	−0.048	0.008	0.043	0.104	−0.088	0.295	−0.012	−0.024	−0.002	0.279	0.049	0.109	−0.028	0.199	0.208	1.000	0.103
Hg	0.010	0.245	−0.086	−0.012	−0.007	−0.083	−0.074	−0.006	0.030	0.118	0.270	0.079	0.267	−0.003	0.399	0.236	0.103	1.000
In	0.000	0.185	0.030	0.027	−0.020	0.120	0.027	−0.005	−0.036	0.048	0.007	0.123	0.080	0.036	0.147	0.083	−0.021	0.027
K	0.005	−0.034	0.896	−0.013	−0.111	0.686	0.793	−0.008	0.337	−0.148	0.193	−0.241	0.057	0.023	−0.218	0.617	0.059	−0.108
La	0.024	−0.057	0.251	−0.084	−0.126	0.180	0.299	0.002	0.195	−0.035	0.990	0.248	0.417	−0.023	0.514	0.589	0.263	0.276
Li	−0.021	−0.031	0.300	0.287	0.331	0.077	0.389	−0.010	0.119	−0.054	−0.055	−0.161	−0.146	0.074	−0.214	0.090	0.092	−0.058
Mg	0.101	−0.061	0.518	−0.012	0.016	0.291	0.315	0.027	0.730	−0.071	0.200	0.484	0.515	0.059	0.288	0.562	−0.067	0.038
Mn	0.066	0.380	0.094	0.030	−0.031	0.190	0.212	0.008	0.129	0.313	0.348	0.427	0.327	0.071	0.523	0.369	0.312	0.279
Mo	0.010	0.373	0.132	0.089	−0.014	0.270	0.100	0.018	−0.026	0.043	−0.020	0.041	0.059	0.085	0.054	0.077	−0.018	0.049
Na	0.000	−0.130	0.890	0.010	−0.058	0.596	0.650	0.006	0.546	−0.154	0.315	−0.091	0.109	−0.016	−0.043	0.732	0.086	−0.051
Nb	0.030	−0.067	0.377	−0.086	−0.136	0.186	0.617	−0.010	0.139	−0.071	0.535	0.044	0.238	−0.023	0.260	0.593	0.596	0.152
Ni	0.105	−0.097	0.161	−0.081	−0.087	0.092	0.161	0.009	0.406	−0.036	0.443	0.782	0.841	0.042	0.692	0.560	0.048	0.230
P	0.048	0.040	0.064	−0.011	−0.021	0.151	0.066	−0.023	0.354	0.038	0.240	0.328	0.371	0.023	0.244	0.230	−0.084	0.082
Pb	0.013	0.889	−0.079	0.052	−0.006	0.120	−0.028	−0.005	0.004	0.705	−0.035	−0.021	−0.098	0.059	−0.038	−0.116	−0.014	0.233
Rb	−0.021	−0.002	0.682	0.033	−0.076	0.461	0.743	−0.012	0.103	−0.093	0.030	−0.307	−0.143	0.034	−0.291	0.339	0.148	−0.137
S	−0.009	0.088	−0.008	0.668	0.352	0.022	−0.078	−0.001	0.175	0.000	−0.119	−0.067	−0.103	0.090	−0.053	−0.062	−0.028	−0.031
Sb	0.017	0.219	−0.057	0.099	0.001	−0.058	−0.046	−0.007	−0.003	0.261	0.027	0.087	0.035	0.002	0.103	0.014	0.046	0.079
Sc	0.113	−0.099	0.513	−0.007	−0.049	0.242	0.363	0.044	0.622	−0.094	0.343	0.542	0.591	0.077	0.438	0.625	0.059	0.098
Sn	0.014	−0.010	0.132	−0.050	−0.053	0.024	0.247	0.001	0.099	−0.001	0.340	0.187	0.240	0.004	0.319	0.419	0.296	0.178
Sr	−0.001	−0.108	0.639	0.016	0.003	0.476	0.413	−0.003	0.643	−0.019	0.243	0.062	0.221	0.312	0.026	0.593	−0.024	−0.036
Ta	0.010	−0.024	0.039	−0.020	−0.024	−0.070	0.327	−0.006	−0.051	−0.013	0.118	−0.082	−0.008	−0.020	0.029	0.150	0.540	0.102
Te	−0.002	−0.004	−0.037	−0.005	−0.005	−0.033	−0.036	−0.001	−0.021	0.019	0.027	0.169	0.069	0.003	0.145	0.061	−0.006	0.076
Th	0.012	−0.089	0.147	−0.052	−0.074	0.053	0.246	0.016	0.088	−0.037	0.628	0.226	0.340	−0.009	0.425	0.399	0.286	0.141
Ti	0.085	−0.092	0.171	−0.071	−0.112	0.080	0.121	0.040	0.327	−0.030	0.667	0.685	0.709	0.006	0.869	0.695	0.200	0.424
Tl	0.056	−0.015	−0.026	0.012	0.057	−0.044	−0.056	−0.006	−0.009	0.084	−0.069	0.022	−0.049	0.007	−0.027	−0.045	−0.015	−0.017
U	0.002	−0.041	0.035	−0.023	−0.030	−0.022	0.205	0.018	0.100	−0.001	0.169	0.247	0.221	0.000	0.218	0.195	0.185	0.088
V	0.091	−0.075	−0.127	−0.048	−0.067	−0.152	−0.114	0.064	0.136	0.015	0.420	0.859	0.716	0.011	0.959	0.441	0.161	0.326
Y	0.042	−0.078	0.491	−0.061	−0.130	0.248	0.638	0.002	0.298	−0.078	0.589	0.142	0.335	0.028	0.298	0.591	0.425	0.178
Zn	0.084	0.470	−0.056	0.007	−0.046	0.036	0.007	0.017	0.122	0.653	0.350	0.544	0.412	0.053	0.629	0.328	0.170	0.343
Zr	0.011	−0.140	0.601	−0.031	−0.111	0.485	0.420	0.003	0.453	−0.139	0.318	0.203	0.267	0.033	0.142	0.507	−0.009	−0.024

Table II-3-2 Correlation Matrix of Stream Sediments (2)

	In	K	La	Li	Mg	Mn	Mo	Na	Nb	Ni	P	Pb	Rb	S	Sb	Sc	Sn	Sr
Au	0.000	0.005	0.024	−0.021	0.101	0.066	0.010	0.000	0.030	0.105	0.048	0.013	−0.021	−0.009	0.017	0.113	0.014	−0.001
Ag	0.185	−0.034	−0.057	−0.031	−0.061	0.380	0.373	−0.130	−0.067	−0.097	0.040	0.889	−0.002	0.088	0.219	−0.099	−0.010	−0.108
Al	0.030	0.696	0.251	0.300	0.518	0.094	0.132	0.890	0.377	0.161	0.064	−0.079	0.682	−0.008	−0.057	0.513	0.132	0.639
As	0.027	−0.013	−0.084	0.287	−0.012	0.030	0.089	0.010	−0.086	−0.081	−0.011	0.052	0.033	0.668	0.099	−0.007	−0.050	0.016
B	−0.020	−0.111	−0.126	0.331	0.016	−0.031	−0.014	−0.058	−0.136	−0.087	−0.021	−0.006	−0.076	0.352	0.001	−0.049	−0.053	0.003
Ba	0.120	0.686	0.180	0.077	0.291	0.190	0.270	0.596	0.186	0.092	0.151	0.120	0.461	0.022	−0.058	0.242	0.024	0.476
Be	0.027	0.793	0.299	0.389	0.315	0.212	0.100	0.650	0.617	0.161	0.066	−0.028	0.743	−0.078	−0.046	0.363	0.247	0.413
Bi	−0.005	−0.008	0.002	−0.010	0.027	0.008	0.018	0.006	−0.010	0.009	−0.023	−0.005	−0.012	−0.001	−0.007	0.044	0.001	−0.003
Ca	−0.036	0.337	0.195	0.119	0.730	0.129	−0.026	0.546	0.139	0.406	0.354	0.004	0.103	0.175	−0.003	0.622	0.099	0.643
Cd	0.048	−0.148	−0.035	−0.054	−0.071	0.313	0.043	−0.154	−0.071	−0.036	0.038	0.705	−0.093	0.000	0.261	−0.094	−0.001	−0.019
Ce	0.007	0.193	0.990	−0.055	0.200	0.348	−0.020	0.315	0.535	0.443	0.240	−0.035	0.030	−0.119	0.027	0.343	0.340	0.243
Co	0.123	−0.241	0.248	−0.161	0.484	0.427	0.041	−0.091	0.044	0.782	0.328	−0.021	−0.307	−0.067	0.087	0.542	0.187	0.062
Cr	0.080	0.057	0.417	−0.146	0.515	0.327	0.059	0.109	0.238	0.841	0.371	−0.098	−0.143	−0.103	0.035	0.591	0.240	0.221
Cu	0.036	0.023	−0.023	0.074	0.059	0.071	0.085	−0.016	−0.023	0.042	0.023	0.059	0.034	0.090	0.002	0.077	0.004	0.312
Fe	0.147	−0.218	0.514	−0.214	0.288	0.523	0.054	−0.043	0.260	0.692	0.244	−0.038	−0.291	−0.053	0.103	0.438	0.319	0.026
Ga	0.083	0.617	0.589	0.090	0.562	0.369	0.077	0.732	0.593	0.560	0.230	−0.116	0.339	−0.062	0.014	0.625	0.419	0.593
Ge	−0.021	0.059	0.263	0.092	−0.067	0.312	−0.018	0.086	0.596	0.048	−0.084	−0.014	0.148	−0.028	0.046	0.059	0.296	−0.024
Hg	0.027	−0.108	0.276	−0.058	0.038	0.279	0.049	−0.051	0.152	0.230	0.082	0.233	−0.137	−0.031	0.079	0.098	0.178	−0.036
In	1.000	0.027	0.015	−0.036	0.000	0.185	0.185	−0.006	0.015	0.056	0.038	0.080	0.003	0.077	0.025	0.012	0.007	−0.009
K	0.027	1.000	0.234	0.350	0.324	0.066	0.135	0.814	0.410	0.057	−0.007	−0.043	0.774	−0.024	−0.076	0.304	0.102	0.528
La	0.015	0.234	1.000	−0.060	0.199	0.342	−0.003	0.345	0.537	0.436	0.239	−0.039	0.042	−0.112	0.020	0.332	0.341	0.267
Li	−0.036	0.350	−0.060	1.000	0.119	0.013	0.100	0.081	0.115	−0.044	−0.208	−0.001	0.479	0.245	−0.019	0.156	0.090	−0.001
Mg	0.000	0.324	0.199	0.119	1.000	0.194	0.034	0.458	0.134	0.710	0.454	−0.080	0.117	−0.035	−0.018	0.892	0.129	0.533
Mn	0.185	0.066	0.342	0.013	0.194	1.000	0.508	0.059	0.445	0.325	0.153	0.396	0.066	−0.010	0.134	0.305	0.314	−0.017
Mo	0.185	0.135	−0.003	0.100	0.034	0.508	1.000	−0.025	0.041	0.009	0.035	0.292	0.127	0.153	0.021	0.058	0.073	−0.039
Na	−0.006	0.814	0.345	0.081	0.458	0.059	−0.025	1.000	0.448	0.163	0.083	−0.128	0.542	−0.024	−0.072	0.403	0.136	0.708
Nb	0.015	0.410	0.537	0.115	0.134	0.445	0.041	0.448	1.000	0.212	0.042	−0.044	0.369	−0.115	0.020	0.277	0.522	0.220
Ni	0.056	0.057	0.436	−0.044	0.710	0.325	0.009	0.163	0.212	1.000	0.461	−0.105	−0.126	−0.109	0.036	0.722	0.273	0.300
P	0.038	−0.007	0.239	−0.208	0.454	0.153	0.035	0.083	0.042	0.461	1.000	0.035	−0.170	0.024	0.015	0.356	0.151	0.346
Pb	0.080	−0.043	−0.039	−0.001	−0.080	0.396	0.292	−0.128	−0.044	−0.105	0.035	1.000	0.015	0.041	0.253	−0.114	−0.004	−0.101
Rb	0.003	0.774	0.042	0.479	0.117	0.066	0.127	0.542	0.369	−0.126	−0.170	0.015	1.000	0.023	−0.007	0.150	0.098	0.261
S	0.077	−0.024	−0.112	0.245	−0.035	−0.010	0.153	−0.024	−0.115	−0.109	0.024	0.041	0.023	1.000	0.044	−0.024	−0.037	0.114
Sb	0.025	−0.076	0.020	−0.019	−0.018	0.134	0.021	−0.072	0.020	0.036	0.015	0.253	−0.007	0.044	1.000	0.039	0.058	−0.024
Sc	0.012	0.304	0.332	0.156	0.892	0.305	0.058	0.403	0.277	0.722	0.356	−0.114	0.150	−0.024	0.039	1.000	0.231	0.434
Sn	0.007	0.102	0.341	0.090	0.129	0.314	0.073	0.136	0.522	0.273	0.151	−0.004	0.098	−0.037	0.058	0.231	1.000	0.102
Sr	−0.009	0.528	0.267	−0.001	0.533	−0.017	−0.039	0.708	0.220	0.300	0.346	−0.101	0.261	0.114	−0.024	0.434	0.102	1.000
Ta	−0.015	0.090	0.113	0.060	−0.075	0.257	−0.014	0.097	0.621	−0.042	−0.074	−0.005	0.196	−0.036	0.001	0.017	0.305	−0.047
Te	−0.003	−0.041	0.024	−0.025	0.009	0.068	−0.006	−0.035	−0.025	0.066	−0.030	−0.003	−0.031	−0.007	−0.004	0.048	−0.010	−0.028
Th	0.010	0.134	0.590	0.024	0.129	0.229	0.026	0.191	0.421	0.321	0.101	−0.055	0.108	−0.060	0.018	0.263	0.325	0.154
Ti	0.081	0.022	0.662	−0.168	0.483	0.468	0.013	0.248	0.431	0.760	0.296	−0.100	−0.149	−0.093	0.078	0.611	0.401	0.276
Tl	−0.017	−0.052	−0.070	0.035	−0.014	−0.045	−0.003	−0.054	−0.065	−0.027	−0.006	−0.008	−0.015	0.047	0.036	−0.011	−0.047	0.121
U	−0.022	0.036	0.154	0.076	0.193	0.175	0.016	0.023	0.215	0.293	0.105	−0.030	0.021	−0.034	−0.011	0.231	0.178	0.029
V	0.125	−0.257	0.400	−0.239	0.313	0.434	0.008	−0.063	0.185	0.702	0.220	−0.086	−0.316	−0.068	0.116	0.457	0.291	0.032
Y	−0.001	0.440	0.556	0.318	0.374	0.405	0.086	0.452	0.764	0.355	0.149	−0.042	0.411	−0.123	0.017	0.554	0.375	0.245
Zn	0.173	−0.111	0.343	−0.126	0.205	0.714	0.196	−0.057	0.219	0.431	0.228	0.566	−0.127	−0.020	0.246	0.260	0.268	0.049
Zr	−0.002	0.491	0.289	0.136	0.600	0.052	−0.010	0.551	0.218	0.448	0.229	−0.128	0.378	−0.026	−0.021	0.610	0.092	0.542

Table II-3-2 Correlation Matrix of Stream Sediments (3)

	Ta	Te	Th	Ti	Tl	U	V	Y	Zn	Zr
Au	0.010	-0.002	0.012	0.085	0.056	0.002	0.091	0.042	0.084	0.011
Ag	-0.024	-0.004	-0.089	-0.092	-0.015	-0.041	-0.075	-0.078	0.470	-0.140
Al	0.039	-0.037	0.147	0.171	-0.026	0.035	-0.127	0.491	-0.056	0.601
As	-0.020	-0.005	-0.052	-0.071	0.012	-0.023	-0.048	-0.061	0.007	-0.031
B	-0.024	-0.005	-0.074	-0.112	0.057	-0.030	-0.067	-0.130	-0.046	-0.111
Ba	-0.070	-0.033	0.053	0.080	-0.044	-0.022	-0.152	0.248	0.036	0.485
Be	0.327	-0.036	0.246	0.121	-0.056	0.205	-0.114	0.638	0.007	0.420
Bi	-0.006	-0.001	0.016	0.040	-0.006	0.018	0.064	0.002	0.017	0.003
Ca	-0.051	-0.021	0.088	0.327	-0.009	0.100	0.136	0.298	0.122	0.453
Cd	-0.013	0.019	-0.037	-0.030	0.084	-0.001	0.015	-0.078	0.653	-0.139
Ce	0.118	0.027	0.628	0.667	-0.069	0.169	0.420	0.589	0.350	0.318
Co	-0.082	0.169	0.226	0.685	0.022	0.247	0.859	0.142	0.544	0.203
Cr	-0.008	0.069	0.340	0.709	-0.049	0.221	0.716	0.335	0.412	0.267
Cu	-0.020	0.003	-0.009	0.006	0.007	0.000	0.011	0.028	0.053	0.033
Fe	0.029	0.145	0.425	0.869	-0.027	0.218	0.959	0.298	0.629	0.142
Ga	0.150	0.061	0.399	0.695	-0.045	0.195	0.441	0.591	0.328	0.507
Ge	0.540	-0.006	0.286	0.200	-0.015	0.185	0.161	0.425	0.170	-0.009
Hg	0.102	0.076	0.141	0.424	-0.017	0.088	0.326	0.178	0.343	-0.024
In	-0.015	-0.003	0.010	0.081	-0.017	-0.022	0.125	-0.001	0.173	-0.002
K	0.090	-0.041	0.134	0.022	-0.052	0.036	-0.257	0.440	-0.111	0.491
La	0.113	0.024	0.590	0.662	-0.070	0.154	0.400	0.556	0.343	0.289
Li	0.060	-0.025	0.024	-0.168	0.035	0.076	-0.239	0.318	-0.126	0.136
Mg	-0.075	0.009	0.129	0.483	-0.014	0.193	0.313	0.374	0.205	0.600
Mn	0.257	0.068	0.229	0.468	-0.045	0.175	0.434	0.405	0.714	0.052
Mo	-0.014	-0.006	0.026	0.013	-0.003	0.016	0.008	0.086	0.196	-0.010
Na	0.097	-0.035	0.191	0.248	-0.054	0.023	-0.063	0.452	-0.057	0.551
Nb	0.621	-0.025	0.421	0.431	-0.065	0.215	0.185	0.764	0.219	0.218
Ni	-0.042	0.066	0.321	0.760	-0.027	0.293	0.702	0.355	0.431	0.448
P	-0.074	-0.030	0.101	0.296	-0.006	0.105	0.220	0.149	0.228	0.229
Pb	-0.005	-0.003	-0.055	-0.100	-0.008	-0.030	-0.086	-0.042	0.566	-0.128
Rb	0.196	-0.031	0.108	-0.149	-0.015	0.021	-0.316	0.411	-0.127	0.378
S	-0.036	-0.007	-0.060	-0.093	0.047	-0.034	-0.068	-0.123	-0.020	-0.026
Sb	0.001	-0.004	0.018	0.078	0.036	-0.011	0.116	0.017	0.246	-0.021
Sc	0.017	0.048	0.263	0.611	-0.011	0.231	0.457	0.554	0.260	0.610
Sn	0.305	-0.010	0.325	0.401	-0.047	0.178	0.291	0.375	0.268	0.092
Sr	-0.047	-0.028	0.154	0.276	0.121	0.029	0.032	0.245	0.049	0.542
Ta	1.000	-0.003	0.147	0.052	-0.020	0.170	-0.001	0.415	0.055	-0.064
Te	-0.003	1.000	0.005	0.079	-0.003	-0.006	0.094	-0.025	0.097	0.004
Th	0.147	0.005	1.000	0.460	-0.029	0.234	0.365	0.483	0.231	0.290
Ti	0.052	0.079	0.460	1.000	-0.049	0.259	0.840	0.465	0.533	0.382
Tl	-0.020	-0.003	-0.029	-0.049	1.000	-0.022	-0.010	-0.053	0.041	-0.040
U	0.170	-0.006	0.234	0.259	-0.022	1.000	0.199	0.216	0.147	0.196
V	-0.001	0.094	0.365	0.840	-0.010	0.199	1.000	0.224	0.554	0.138
Y	0.415	-0.025	0.483	0.465	-0.053	0.216	0.224	1.000	0.193	0.463
Zn	0.055	0.097	0.231	0.533	0.041	0.147	0.554	0.193	1.000	0.012
Zr	-0.064	0.004	0.290	0.382	-0.040	0.196	0.138	0.463	0.012	1.000

Table II-3-3 Rotated Component Matrix

	Component											
	1	2	3	4	5	6	7	8	9	10	11	12
Au	0.16	0.01	-0.01	0.04	-0.07	-0.02	0.12	-0.02	-0.11	-0.18	0.51	-0.36
Ag	-0.10	-0.02	0.81	-0.06	-0.06	0.02	0.31	0.00	-0.04	0.09	-0.14	-0.09
Al	0.04	0.96	-0.06	0.04	0.04	-0.02	0.05	0.07	0.02	-0.01	0.00	0.02
As	-0.04	0.00	0.04	-0.02	0.00	0.86	0.08	0.06	0.01	-0.05	0.01	0.03
B	-0.02	-0.10	0.00	0.02	-0.09	0.73	-0.13	0.09	0.01	-0.03	0.02	-0.05
Ba	-0.04	0.74	0.07	-0.13	0.06	-0.07	0.34	-0.07	-0.07	0.06	-0.08	-0.06
Be	-0.02	0.74	-0.03	0.40	0.09	-0.11	0.07	0.29	-0.02	-0.01	0.01	-0.04
Bi	0.06	0.01	0.01	0.00	-0.04	0.00	0.04	-0.01	-0.07	-0.02	-0.05	0.83
Ca	0.43	0.57	0.08	-0.02	-0.11	0.29	-0.26	-0.14	-0.19	0.06	-0.09	-0.06
Cd	-0.01	-0.11	0.84	0.00	-0.03	-0.01	-0.13	-0.04	0.00	0.00	0.13	0.06
Ce	0.30	0.19	0.04	0.19	0.85	-0.06	-0.04	-0.06	-0.04	-0.02	-0.05	-0.04
Co	0.89	-0.15	0.06	-0.02	0.03	-0.05	0.11	0.02	0.07	0.02	0.09	0.09
Cr	0.80	0.07	-0.04	0.07	0.20	-0.07	0.08	-0.03	-0.01	-0.01	0.02	-0.08
Cu	0.02	0.04	0.03	0.00	-0.01	0.02	0.08	0.05	0.05	0.90	0.08	0.00
Fe	0.80	-0.18	0.06	0.14	0.39	-0.02	0.18	-0.10	0.19	-0.03	0.04	0.08
Ga	0.48	0.67	-0.03	0.26	0.32	-0.03	0.06	-0.10	0.13	-0.03	0.01	0.03
V20	0.03	-0.03	0.01	0.77	0.16	0.08	-0.03	0.06	0.04	-0.03	0.07	0.02
Hg	0.23	-0.11	0.30	0.13	0.30	0.05	-0.03	-0.12	0.26	-0.01	-0.23	-0.17
In	0.09	0.03	0.03	-0.01	-0.03	0.04	0.59	-0.16	0.01	-0.03	0.06	0.08
K	-0.14	0.91	-0.06	0.09	0.08	-0.05	0.11	0.14	0.04	-0.04	0.00	-0.01
La	0.28	0.23	0.03	0.19	0.84	-0.06	-0.02	-0.10	-0.03	-0.02	-0.06	-0.05
Li	-0.13	0.26	-0.02	0.08	-0.03	0.38	-0.03	0.73	0.10	0.01	0.05	-0.04
Mg	0.71	0.53	0.01	-0.08	-0.16	0.05	-0.17	0.09	-0.19	0.04	-0.06	-0.07
Mn	0.39	0.06	0.47	0.39	0.14	0.00	0.47	0.07	0.06	0.02	-0.06	-0.04
Mo	0.03	0.09	0.21	-0.01	-0.03	0.07	0.73	0.18	-0.08	0.11	-0.12	-0.08
Na	0.03	0.90	-0.10	0.12	0.13	0.02	-0.07	-0.19	0.02	-0.05	-0.01	0.04
Nb	0.10	0.35	-0.01	0.79	0.34	-0.10	0.05	0.03	0.00	-0.04	-0.01	-0.01
Ni	0.90	0.15	-0.01	0.00	0.16	-0.06	-0.04	0.07	-0.07	0.03	-0.02	-0.06
P	0.45	0.12	0.09	-0.04	0.03	0.03	-0.07	-0.27	-0.47	0.13	-0.16	-0.20
Pb	-0.11	-0.02	0.93	-0.03	-0.03	0.00	0.14	0.04	-0.04	0.03	-0.08	-0.07
Rb	-0.29	0.70	-0.01	0.19	0.00	-0.04	0.12	0.40	0.11	-0.04	0.08	0.03
S	-0.06	0.01	0.00	-0.05	-0.02	0.81	0.17	-0.03	-0.04	0.12	0.02	0.03
Sb	0.06	-0.03	0.42	0.01	0.05	0.08	-0.09	0.01	0.03	-0.15	0.27	0.19
Sc	0.75	0.47	-0.02	0.05	-0.01	0.03	-0.10	0.19	-0.09	0.03	-0.01	-0.03
Sn	0.24	0.08	0.04	0.52	0.24	-0.01	0.04	0.02	-0.05	0.04	-0.06	0.00
Sr	0.20	0.71	-0.02	-0.03	0.07	0.12	-0.20	-0.31	-0.13	0.39	0.10	0.02
Ta	-0.08	0.02	0.00	0.86	-0.07	-0.03	-0.02	0.01	0.00	0.01	-0.03	-0.02
Te	0.15	0.00	0.03	-0.03	-0.08	-0.01	-0.07	-0.03	0.76	0.08	-0.10	-0.09
Th	0.22	0.09	-0.03	0.18	0.71	-0.04	-0.01	0.19	-0.08	0.04	0.04	0.06
Ti	0.79	0.12	0.02	0.17	0.46	-0.03	0.03	-0.13	0.10	-0.03	-0.02	0.04
Tl	-0.02	-0.02	0.06	-0.04	-0.02	0.04	-0.08	-0.01	-0.01	0.18	0.72	0.02
U	0.31	-0.03	0.01	0.23	0.06	-0.07	-0.10	0.41	-0.20	0.10	-0.15	0.06
V	0.83	-0.20	0.01	0.11	0.28	-0.03	0.13	-0.10	0.16	-0.04	0.09	0.12
Y	0.26	0.45	0.00	0.51	0.37	-0.07	-0.02	0.31	-0.05	-0.02	-0.03	-0.06
Zn	0.49	-0.06	0.71	0.16	0.20	-0.02	0.17	-0.08	0.10	0.01	0.09	0.03
Zr	0.34	0.64	-0.09	-0.13	0.16	-0.05	-0.12	0.19	-0.11	0.04	-0.04	0.02

Extraction Method: Principal Component Analysis. · Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 15 iterations.

Ca	Al	Ag	V20	Ce	As	In	Li	(-)P	Cu	Au	bi
Co	Ba	Cd	Nb	La	B	Mn	Rb	Te		Tl	
Cr	Be	Mn	Sn	Th	S	Mo	U				
Fe	Ca	Pb	Ta	Ti							
Ga	Ga	Sb	Y								
Mg	K	Zn									
Ni	Mg										
P	Na										
Sc	Rb										
Ti	Sc										
V	Sr										
Zn	Y										
	Zn										

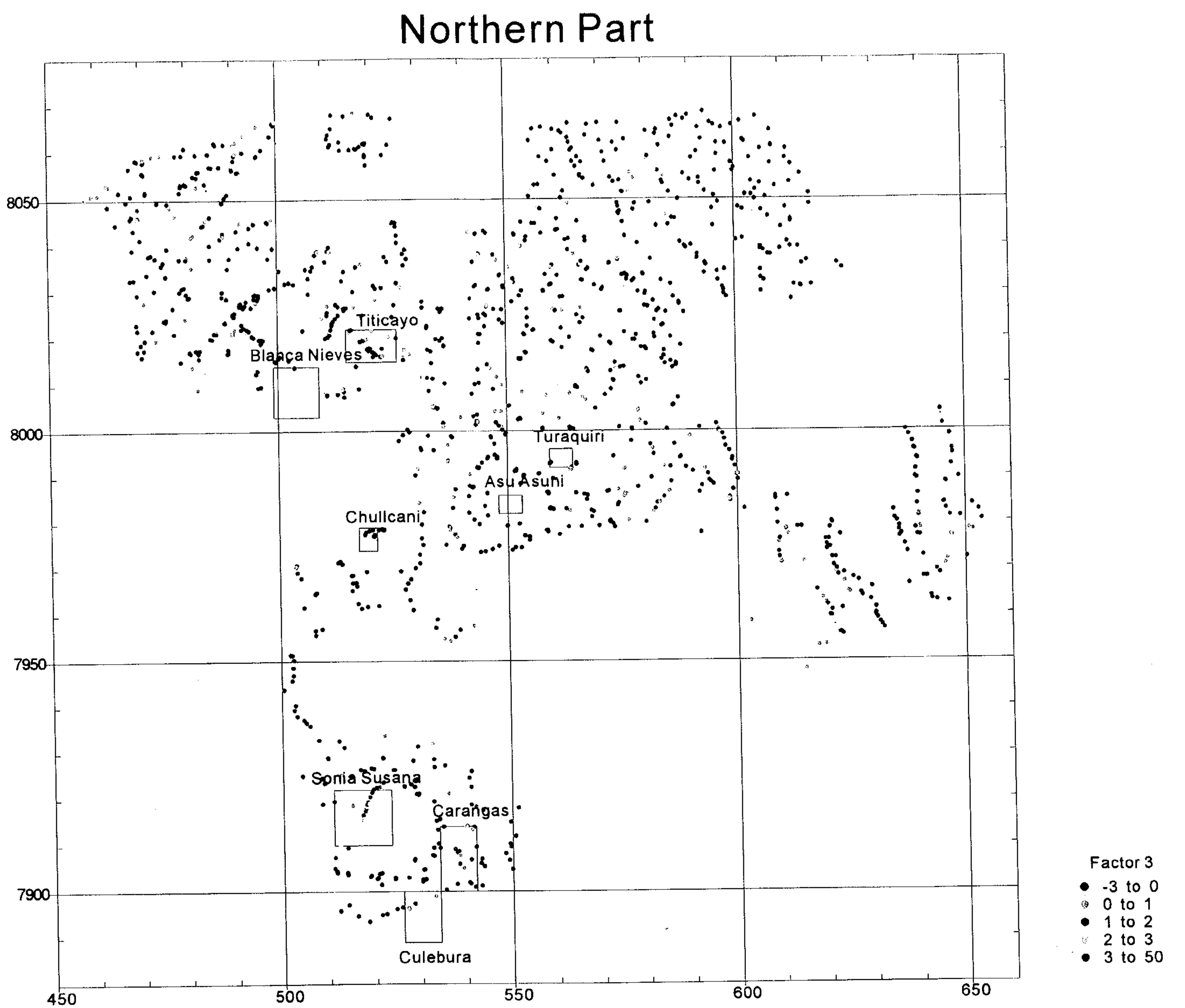


Fig.II-3-1(1) Geochemical Anormaly Map of the Stream Sediments (Northern Part)

Southern Part

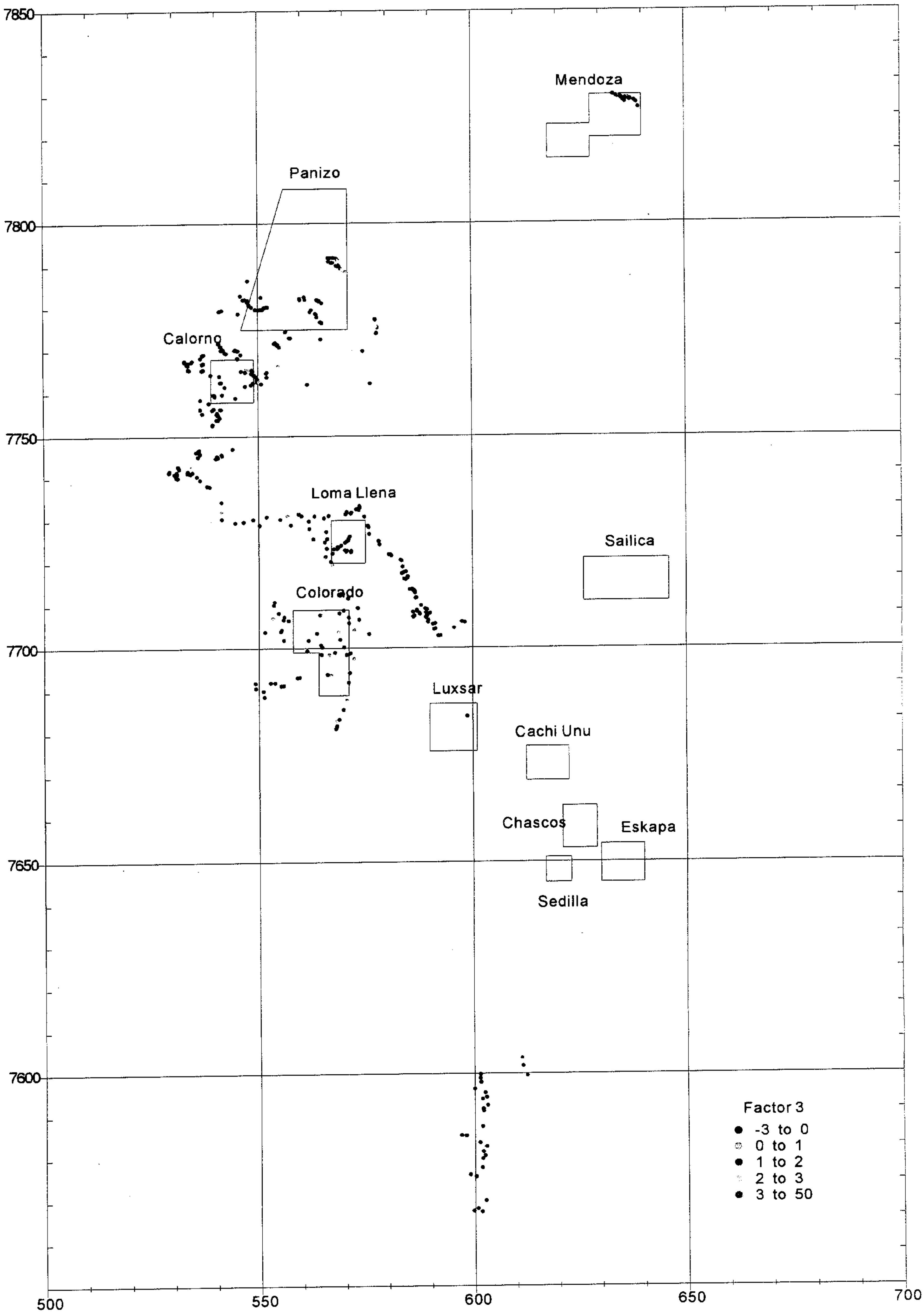


Fig.II-3-1(2) Geochemical Anormaly Map of the Stream Sediments (Southern Part)

PART III CONCLUSIONS AND RECOMMENDATIONS

Chapter 1 Conclusions

5-1 Conclusions

Result of the phase I and phase II survey revealed that there is a possibility of existing the following types of ore deposit beneath the widely spread hydrothermal alteration zone in volcanics.

Type I : Bolivian type polymetalic deposits

A: rich in silver and tin

B: rich in silver, gold and copper

Type II: Epithermal gold- silver- lead- zinc deposits, related to shallow volcanic activity.

Type III: Epithermal gold- silver- lead- zinc- copper deposits, related to shallow sub-volcanic intrusion.

Type VI: Low-sulfidation epithermal gold- silver- copper deposits (quartz- alunite vein).

Type V : High-sulfidation epithermal deposits (quartz- adularia vein)

The survey findings by district are summarized as follows:

Turaquiri district

The ore deposits of Turaquiri district are epithermal barite- quartz veins associated with base metals and precious metals which occur along the east-westerly fractures formed by the development of caldera.

Based on the facts that the alteration is neutral without tin anomaly, and no intrusive rock was recognized in the area, the mineralization of this area has both characteristics of low-sulfidation epithermal deposit (Type V) and epithermal precious metal deposit (Type III).

Considering that only the mineralized veins have been mined in the previous mining operation, as the case of Tordos deposit at San Cristóbal mine, it is possible that a low grade stockwork or disseminated type deposits might have been left behind. Particularly the presence of mineralization is expected in the area where two veins are intersecting in deep underground.

Asu Asuni district

An alteration zone associated with hydrothermal breccia was found in the east of the alteration zone studied in the phase I survey. No remarkable mineralization and geochemical anomaly are observed in alteration zone and the mineralization is probably weak or occurs in deeper part, if it exists.

Chullcani district

As the result of phase II survey a ring-shaped hydrothermal alteration zone was found at the ridge of Loma Huarin Uma, and hydrothermal breccia (as dykes, pipes and masses) and silicified veins are distributed radially, suggesting the presence of crypto-intrusive rock in deep underground. Alunite, kaolinite and pyrophyllite were identified as alteration minerals indicating that the alteration is acidic type.

Result of the geochemical survey shows that the anomalies of gold are scattered around the center of the alteration zone and the anomalies of antimony and barium are widely distributed over the alteration zone. Small anomalies of lead arsenic, molybdenum and tin are also scattered.

Based on the facts described above, the mineralization in Chullcani district is presumed to be epithermal gold- silver- lead- zinc deposit (Type II), related to shallow volcanic activity. Beside there is a possibility of existing ore deposits around the crypto-intrusives. In addition, as the presence of pyrophyllite and copper anomalies are recognized in part, there is a possibility of over-printing of mineralization by high-sulfidation epithermal deposit (type IV).

Sonia - Susana disrict

Two types of geochemical anomalies, gold- copper- lead- zinc and gold- tin- antimony-arsenic, are recognized in the area. This implies different types of mineralization have place at least in two stages. The former is the epithermal deposit related to shallow hypabyssal intrusion (Type III), and the later is the epithermal gold- silver-lead- zinc deposit related to shallow volcanic activity (Type II).

Porphyry type mineralization is expected to occur beneath the older mineralization, and epithermal precious metal deposit is expectable beneath the young mineralized zone.

COMINCO Bolivia has carried out exploration including diamond drilling of 10 holes, geochemical survey and IP survey. Comprehensive study including these data is necessary.

Calorno district

The hydrothermal alteration zone widely distributed in this district represent the upper most (outer most) zone of alteration.

Bodies of gossan distributed along Rio Agua Milago in the south east of the area which mainly consist of goethite, indicate anomaly of arsenic and antimony in its upper stream part. Hot water spout out from the ground in its vicinity. Existence of low-sulfidation epithermal deposit (Type V) may be possible in its area, as the area is far away from the center of volcano.

The hydrothermal alteration zone in the north of the area is possibly formed by the highly acidic solution, which shows tin anomaly too. That suggests the mineralization of the area correspond to either sulfide- rich epithermal type (Type IV) or epithermal gold- silver- lead- zinc type (Type II).

Although the geochemical anomaly is not extensive, as the vast amount of hot water is spouting out and wide area is covered by the hydrothermal breccia existence of large deposits can be expected.

Loma Llena district

The hydrothermal alteration zone in this district represents the upper most (outer most) zone of alteration. A part of the alteration zone could have formed from highly acidic solution. Further more as there are tin anomalies, the mineralization in this district seems to be high-sulfidation type deposit (Type IV) or epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity. However as the pyrite dissemination is weak and the geochemical anomalies are not predominant, the mineralization in this area is probably weak in case it exists.

Blanca Nieves district

The mineralization in Blanca Nieves district appears to correspond to an epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity from the presence of tin. The mineralization, however, is probably weak or deep-seated in case it exists.

The fractures of northwest direction are developed in Titicayo prospect, in which manganese bearing silver mineralization was recognized. This mineralization, as similar to that of Carangas prospect, appears to correspond to an epithermal precious metal deposit (Type III) although any itrusives are not yet found.

Carangas district

Silver- bearing manganese oxide mineralization is recognized in the fracture and bedding planes in San Francisco prospect. The alteration is weak and neutral type without tin anomaly.

The mineralization in this district is thought to be the epithermal precious metal deposit (Type III) related to shallow hypabyssal intrusives, although the existence of intrusives not yet confirmed.

However, the mineralization is probably weak as the alteration zone is not extensive and development of the fracture is poor. In Carangas mine an alteration zone is recognized at Co. Espiritu, and and it is weak at Co. San Antonio. Both of them are neutral and tin anomaly is not yet found. The mineralization in this district is thought to be epithermal precious metal deposit (Type III) related to shallow hypabyssal intrusives, which were recognized at Co. Espiritu.

Silver- bearing manganese oxide mineralization is observed along the fractures at Co. San Antonio. The mineralization seems to be weak.

Culebra district

As the alteration of Todos Santos mine is neutral and tin anomaly is not recognized, the mineralization in this district appears to be epithermal precious metal deposit (Type III) related to shallow hypabyssal intrusives, which was observed at Todos Santos mine.

The mineralization in Culebra prospect is presumed to be a gold- silver- lead- zinc deposit (type II) related to shallow volcanic activity from the presence of tin anomaly.

The mineralization is probably weak or deep-seated if it exists.

Mendoza district

The presence of epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity is presumed in Co. Kancha. The result of K-Ar dating of the alteration minerals shows 16 Ma, corresponding to middle Miocene, while the age of dacite laccolith intrusive in the east of the area is 8.0 Ma, it is suggested that the hydrothermal alteration took place at least twice in the area. The mineralization, however, is probably weak or deep-seated, as the geochemical anomalies are weak and scattered.

The ore deposit of La Deseada mine is an epithermal gold- silver- lead-zinc deposit (Type II) related to shallow volcanic activity. The existence of the similar ore deposit to La Deseada ore deposit is expected beneath the geochemical anomaly of Co. Mokho. Besides, as the alteration zone of Co. Mokho is continuously extended to La Deseada mine, the mineralization of two areas is probably connected.

The mineralization of both Guadalupe mine and Maria Lúisa mine is presumed to be an epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanism assumed from the presence of tin anomaly. On the other hand, enargite collected from the waste of the portal suggest that there was a high-sulfidation epithermal mineralization (Type IV). As the ore of enargite and pyrite is brecciated, two stages of mineralization have probably taken place.

The mineralization of Iranuta prospect correspond to epithermal deposit (type III) related to shallow hypabyssal intrusion, judging from neutral alteration and no tin anomaly.

Homogenization temperature of fluid inclusion shows 258℃ in average, suggesting that the mineralized temperature correspond to the deeper part of mineralized zone. Additionally, it is possible to exist porphyry type ore deposit beneath the mineralized zone.

The mineralization at Co. Chorka is presumed to be high- sulfidation epithermal deposit (Type IV), judged from the presence of acidic alteration minerals such as kaolinite, alunite and pyrophyllite, although the geochemical anomaly is not remarkable. As the anomalies of lead and antimony are more or less concentrated and hydrothermal breccia and breccia pipe which formed along the fractures are extensively developed. Possibility of existing ore deposit in deeper portion is probably high.

Panizo district

An epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity is expected to occur in Vilasaca prospect assumed from the presence of tin anomaly. As the geochemical anomaly is weak, the mineralization will be weak or deep-seated.

In Pacoloma prospect anomalies of arsenic and antimony are scattered and type of ore deposits is difficult to be estimated. The mineralization is also weak or deep-seated.

An epithermal gold- silver - lead- zinc deposit (Type II) related to shallow volcanic activity is expected to occur in Tulco prospect from the presence of tin. There is a possibility of existence of ore deposits in the area where geochemical anomalies of arsenic and antimony are overlapped. But as there is no other geochemical anomaly, the mineralization will be deep if it exists.

The ore deposits in Chinchilhuma prospect are appear to be epithermal precious metal deposit (Type III) related to shallow hypabyssal intrusion as the alteration zone is neutral and tin is not recognized.

In Puquisa prospect, the alteration zone is small and geochemical anomalies are very weak. Therefore, mineralization type is not clear, and the mineralization will be weak or deep-seated if it exists.

In Panizo prospect, There are anomalies of gold, arsenic, antimony in the northern part, anomalies of copper, arsenic, antimony, molybdenum and tin in the central part, and anomalies of gold, silver, lead, arsenic, antimony and tin in southwestern part. Considering the presence of tin and pyrophyllite, the mineralization of north and southwestern parts of the area will be epithermal gold- silver- lead- zinc deposit (Type II), and in the central part high-sulfidation epithermal gold- silver- copper deposit (Type IV) are expected.

In the southwestern part, as there are abundant kaolinite, mineralization of high-sulfidation epithermal deposit could be overlapped.

Based on the K-Ar dating of the alteration showed late of middle Miocene, erosion has been considerably advanced. Beside the geochemical anomalies are rather intense, suggesting that there is a possibility of existing ore deposits in the place, not very deep from the surface.

Sailica district

The mineralization of Plasmar mine corresponds to epithermal gold- silver- lead- zinc deosit (Type II) related to shallow volcanic activity that is estimated from the previous data and result of geochemical survey. And there is a possibility of overlapping of high-sulfidation gold- silver- copper mineraliztion (Type IV) from the presence of pyrophyllite and copper anomalies. As there is an extensive alteration zone and remarkable geochemical anomaly, the possibility of existence of ore deposits in deep underground seems to be high.

The mineralization of Solucion mine corresponds to epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity from the previous data analysis and geochemical assay result. Judging from the mode of occurrence and size of ore deposit in underground working, and extent of geochemical anomaly and alteration, the possibility of existing a large-scale ore deposit seems to be low.

Colorado district

The mineralization in Bayos prospect seems to be weak or deep-seated if it exists, as the hydrothermal breccia is small, consisting mainly of argilization and there is non of remarkable geochemical anomaly.

The mineralization in Okhe prospect is presumed to correspond to an epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity from the presence of tin. The mineralization seems to be weak or deep-seated if it exists, as the alteration and geochemical anomalies are weak.

The mineralization in Perenal prospect corresponds to an epithermal gold- silver- lead- zinc deposit (Type II) related to shallow volcanic activity presumed from the presence of lead and tin. The existence of ore deposits is expected as the silicification is strong and extend toward northwest.

The mineralization in Colorado prospect corresponds to a high-sulfidation mineralization (Type IV) from the presence of pyrophyllite. It is also possible to be an epithermal gold- silver- lead- zinc deposit (Type II) though there is no tin anomaly. The mineralization appears to be weak or deep-seated if it exists, as the area is located in outer most of alteration zone and geochemical anomalies are weak.

Luxsar district

Although hydrothermal breccia occurs around a dome, as the silicification is weak and there is no geochemical anomaly, the mineralization is probably weak or deep-seated.

Cachi Unu district

The mineralization of this district is presumed to be correspond to Bolivian type polymetallic silver- copper deposit (Type I B) or high-sulfidation epithermal type (Type IV). Probably the mineralization is weak or deep-seated, as the alteration and geochemical anomaly is not remarkable.

Sedilla district

The alteration is weak and only one geochemical anomaly portion of arsenic and antimony was detected in chascos prospect. The mineralization will be weak or deep-seated if it exists, as there is no hydrothermal alteration around a dome.

The mineralization in Sedilla prospect corresponds to epithermal gold- silver- lead- zinc deposit (Type II) presumed from the presence of tin anomaly. Probably it is weak or deep-seated, as the alteration and geochemical anomaly are weak.

A neutral-type alteration zone is widely distributed in Eskapa prospect,and ore deposit is expected in shallow portion.

The mineralization appears to correspond to epithermal gold- silver- lead- zinc deposit (Type II) from the presence of tin and silver- lead anomalies. It is also possible the mineralization of the area correspond to upper part of porphyry type mineralization from the presence of neutral alteration.

As a summary of the results of Phase I and Phase II surveys, in the districts of Turaquiri, Sonia-Susana, Carangas, Chinchilhuma in Panizo and Eskapa in Sedilla, erosion has considerably advanced to exposed rather deeper part of mineralization, and the porphyry type gold- copper deposits are often expected at shallower part from surface.

In addition to the above, a possibility of existing ore deposits seems to be high in the districts of Chullcani, Calorno, La Deseada mine and Chorka in Mendoza and Plasmar mine in Sailica, as there are dome structures, intrusives and remarkable hydrothermal breccia indicating the area was subjected by intensive hydrothermal alteration.

Chapter 2 Recommendations for Phase II

As a result of the phase I and Phase II survey, it was revealed that the extensive hydrothermal alteration zones are distributed in the Oruro - Uyuni region and beneath of them the existence of the ore deposits of epithermal gold- silver- lead- zinc and high-sulfidation epithermal gold- silver- copper (quartz- alunite type) related to shallow volcanic activity, and the ore deposits of epithermal gold- silver- lead- zinc and low-sulfidation epithermal (quartz-alunite type) related to shallow hypabyssal intrusion is possible.

In the Cordillera Occidental, however, where erosion is not advanced and the surface is covered by young volcanics, the mineralization is not well investigated, so that an effective way of further exploration is not found yet.

In the phase III survey, it is recommended to carry out a detailed geological survey and geophysical survey for the potential area to obtain further information and then to conduct diamond drilling to prepare three dimension model (including geological structure alteration zone, resistivity and geochemical behavior) and finally to select the prospecting areas.

1) Chullcani district

It is advisable to conduct detailed geological survey to investigate mineralization and geological structure (depth and shape of intrusive rocks) for the area around gold anomaly, then electric survey (IP survey) to obtain further information on the alteration zone and mineralization by resistivity and polarization and finally diamond drilling to check and confirm the three dimension model.

2) Turaquiri district

Detailed geological survey to investigate the western extension of the known mineral vein and the presence of parallel vein, ore shoots and disseminated mineralization is firstly to be conducted. Then electric survey (IP survey) to investigate polarization (mineralization) and finally diamond drilling to confirm the three dimension model are to be carried out.

3) Panizo district (Panizo prospect)

Distribution of two gold (silver) anomalies and one copper- lead- arsenic anomaly are known by the previous survey. It is recommendable to conduct detailed geological survey for the above mentioned three anomalies to investigate characters of mineralization and extent of alteration zones. Then conduct electric survey (IP survey) to investigate deep underground geological structure and mineralization by resistivity and polarization.

4) Calorno district

Very wide hydrothermal alteration zones, through they are not so strong are distributed in this district. However as the vast amount of hot water is spouting out there is a possibility of existing high- sulfidation mineralization and low- sulfidation mineralization, it is advisable to conduct electric survey (IP survey) to obtain the deep underground geological information.

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