ore zone, and that the mineralized zone resembles the hangingwall more than the footwall (Fig. II-5-12-6).

8) Characteristics of the satellite image

Although the quality of the image covered with clouds is not good, on the ASTER image, granite on both the east and west sides in the middle southern part of Aguilar Mountains shows a light color, and the Ordovician sedimentary rocks passed through by this is recognized by a dark color. The N-S strike of these sedimentary rocks can be also read. However, it is difficult to specify the presence of SEDEX deposits.

9) Comment

Energetic periphery drilling prospecting activities taken so far have brought about such positive results that another two ore bodies were captured under the main ore body of Mina Esperanza, but prospecting in the northern extension is not yet sufficient. In order to confirm the northern extension of the ore body, it is desired to carry out geological minute investigation with rock geochemical exploration used together. We consider that, if the ASTER image with good picture quality is obtained, the ASTER image will be useful for identification of upper and lower layers in the mineralized zone.

10) Reference materials

5-2-13 Rio Grande mineral showings (Zone 15)

1) Location

At 23°07' 51.2"S. Lat. and 65°41' 16.5" W. Long.

It is located about 10 km north of El Aguilar mine and along the Rio Grande river.

2) Access

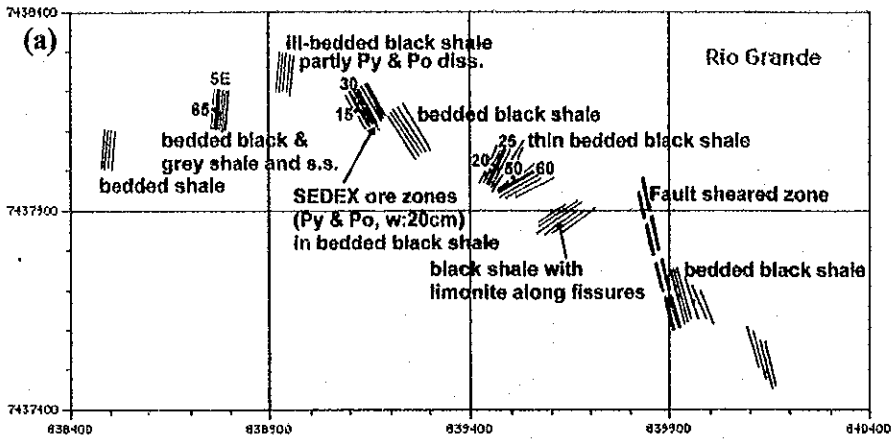
This place is accessed by driving on the private road which passes from El Aguilar mine to Tres Cruces, and taking upstream an abandoned prospecting road along the Rio Grande river from a private road. A car can be driven halfway.

3) Past survey

* 1992: SEDEX mineralization was discovered and two prospecting drillings (one in Pirro valley and the other on the left bank of Rio Grande) were carried out.

4) Geology and tectonics

According to a geological map drawn with a scale of 1 to 2,000 by Campana Minera Aguilar S.A., there is distribution of the Lampasar, Cardonal and Acoite formations of the Ordovician in the



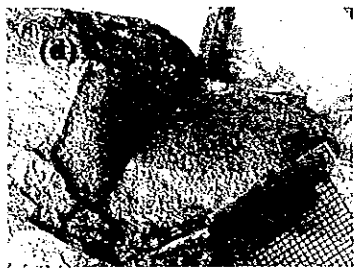


Fig.II-5-2-13-1 SEDEX ore zone observed in the Rio Grande
(a) Geology and mineralization along Rio Grande
(b) Overview of the SEDEX mineralized zone in the Ordovician sediments
(c) SEDEX ore zone (about 20cm in thickness) occurrence sedimentary structure
(d)Macroscopic view of SEDEX composed of mainly pyrrohtite and pyrite

Rio Grande prospect. The Lampasar Formation in the downstream area repeats folds with an axis in the NNW-SSE to NE-SW.

According to Sureda, R.J. (1999), in Rio Grande Valley and Pirro Valley, a small branch, the Lampasar Formation shows characteristic lithofacies comprising black lutite with alteration to pyrite accompanied by a large amount of graphite and has gray sandstone and dark limestone in a narrow space.

5) Mineral showings and alteration

Mineralization narrowly exists in black lutite with alteration to pyrite of the Lampazar Formation and shows ferruginous chert of several millimeters to several centimeters. In the top part of an anticlinal structure of the second order, exhalitas with a width of up to 4 m is observed. The chert layer is inclined toward the north by 10° together with the anticlinal axis, and is thinner toward the north. This means that the spread of hot water is relatively stronger southward. Paragenesis of minerals is mainly iron sulfide (pyrite, magnetic pyrite, melnicovite and marcasite) and is accompanied by a small amount of zincblende, galena and chalcopyrite. Gangue minerals of the chert are calcite, siderite and barite and muscovite (Surada, R.J., 1999).

In this survey, we confirmed massive pyrrhotite layers (with the maximum width of 20 cm) at two points: a point (A01KN053) about 5 m up a steep valley without water from the main course of the Rio Grande river, and a point in the place about 10 m further up. It is not clarified whether or not these ore beds are those at the same points as SEDEX mineralization was discovered for the first time in 1992, but these beds are immediately above a stromatolite layer in bedded black shale and show a strike of N30° W and a dip of 15° SW. These mineralized horizons could be traced at least 150 m in the inclined direction (Fig.II-5-13-1).

Although SEDEX mineralization discovered in this Rio Grande mineral showings is similar to that of the ore body in Mina Esperanza, the final assessment shows profit will not be obtained from the viewpoint of ore reserves (Sureda et al., 1994).

6) Characteristics of the satellite image

Characteristics of this mineral showings cannot be confirmed because picture quality of the ASTER image obtained this time is poor.

7) Comment

Even if this mineral showings itself is not profitable (Sureda et al., 1994), it is important that the presence of the horizon of the ore body in Mina Esperanza could be confirmed. Further northward prospecting is desired.

5-2-14 La Colorada mineral showings (Zone 18)

1) Location

This place is located 65 km north of San Anto de los Cobres and at the east foot of the Sierra de Cobre, at lat. 23°38' 52.6" S, long. 66°17' 26.9 W and 3,577 m above sea level (an abandoned open-cut mining site on the east side).

2) Access

This place is accessed by driving 68 km on National Road 40 and then State Road 38 from San Anto de los Cobres, which takes one-and -a-half hours. The roads allow high-speed travel although unpaved.

3) Past surveys

* 1955 - 1956: Compana Minera Aguilar carried out geological surveys, physical exploration (IP and electromagnetic method) and drillings (9 holes, 800 m).
* 1988 - 1990: the Army Arsenal (FM) carried out geological surveys, geochemical exploration and drillings (2 holes, 300 m).
* 1992: Pacific Rim Co., Ltd. obtained a mining right.
* 1993 - 1999: Pacific Rim Co, Ltd. carried out satellite image analysis, airborne magnetic surveys, EM, CSAMT, TEM, TFM and drillings (five holes, 1,086 m). Massive sulfide deposits of three stratigraphys were captured. It was estimated that reserves (estimated + anticipated) were 12.5 million tons. The following grades were also estimated: 7 to 10 g/t for Ag, 0.5% for Cu, 0.1 to 1% for Pb, 0.9 to 1% for Zn and 33 to 50% for Fe. They judged that there was not sufficient economic effectiveness, waived the mining right and withdrew. Data was donated to the Mining Bureau of Salta State. For detailed information on geology and deposits, see the paper of Meyon et al. (1999) and the report of Pacific Rim Co., Ltd. (donated to the Mining Bureau of Salta State).

4) Geology and tectonics

This mineral showings is located at the eastern foot of Sierra de Cobres. It belongs to Complejo magmatico-sedimentario Escaya-Cochinoca (Coira et al., 1998). As the place is accompanied by island-arc volcanic - plutonic rocks in addition to thick frish sediments, it has characteristics that differ from the sedimentary body on the east side, which hosts Aguilar deposits and SEDEX deposits. Cobres granodiorite of the Ordovician to the Silurian (corresponding to Faja Eruptiva del Puna granite rocks) intrudes on the west side, and El Lacolito Compuesto de Rangel consisting of syenite, alkali granite and dike composites intrudes on the east side, with Ordovician Chiqueros layer (corresponding to Acoyte layer) that hosts massive sulfide deposits between. Thermal metamorphism due to intrusion of granite was received as well as regional metamorphism and deformation, and altered to hornfels. Chiqueros layer comprises black clayslate and a thin limestone layer. Folds of various orders develop, and development of the schistosity is remarkable. At the drilling cores made by the Racific Rim Co., Ltd., a thin andesite layer has been captured besides clayslate.

5) Mineral showings and alteration

Gossan develops on the mountain side, surrounding Cobres community (Fig. II-5-2-15-1). Gossan consists of hematite, limonite, jarosite, copper oxide and white clay (kaolin and dickite). There are not sulfide minerals. Gossan develops in the clay part of the fault cutting the schistosity of clayslate, and presents a vein shape showing the direction of N30-50° E as long as seen on the ground surface. In the gossan part, many blind levels, abandoned open-cut mining sites and debris accumulation are left. It seems that selective mining of copper oxide was carried out there. There is interpretation that the gossan along this fault was generated by removal of the SEDEX deposits in the lower part.

According to the results of exploration made by Pacific Rim Co., Ltd., it seems that three sulfide deposit horizons were captured from detailed geological surveys of the ground surface and drillings. The ground surface consists of gossan. It shows a vein-like shape in one view, and sulfide minerals appear 3 m under the ground surface and downward. What was observed at drilling cores dug by Pacific Rim Co., Ltd. is massive sulfides slightly accompanied by pyrite and chalcopyrite, part of which fills the rubble portion of the wall rock. According to Mayon et al. (1999), primary sulfides confirmed with samples at drillings are pyrrhotite, zincblende, chalcopyrite, galena, magnetite, loellingite, natural bismuth, tin stone, tetrahedrite and electrum.

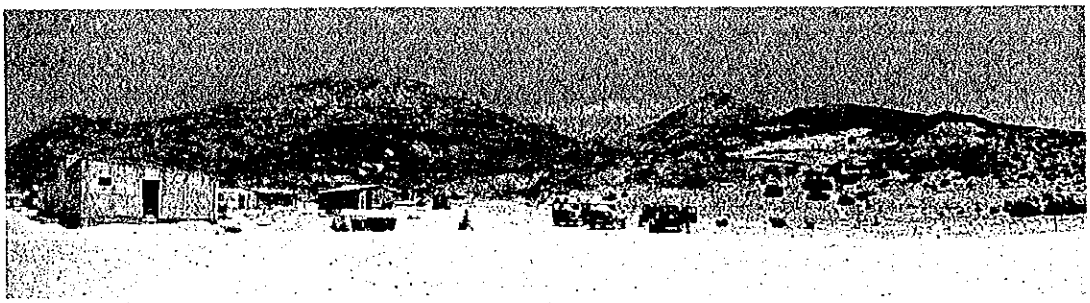
The result of microscopic examination of massive sulfide ores (LC03) given by the Mine Bureau of Salta State was that these ores presented netlike or veinlike shapes, and there was survival of altered wall rock that seems to have originated in basic rock composed of chlorite, phlogopite and spinel. The ore minerals are comprised of irregular auhedral granular chalcopyrie, and a small amount of irregular anhedral vein-like pyrite and anhedral zincblende, gangue minerals comprise quartz and chorite. Massive sulfide ores (LC06) are mainly made up of lamellar, granular or mosaic anhedral pyrrhotite. Partly, a small amount of chalcopyrite is produced and replaces pyrrhotite. Netlike irregular anhedral chalcopyrite and pyrite, respectively, accompany a flake aggregate of chlorite and phlogopite closely. Regarding these two samples, the rubble structure is clearly observed with the naked eye. It seems that the sulfide fills between rubble. The result of microscopic examination of volcanic rocks (LOC02 and LOC05) is that Sample LOC02 is metamorphic rocks originating in muddy rock, and is composed of biotite, muscovite and anthphyllite. Sample LOC05 presents holocrystaline equigranular texture, and consists of alternation minerals such as clinopyroxenes, brown amphibole, sericite, smectite and chlorite. It is assumed that the source rock is gabbro (Fig. II-5-2-15-2).

6) Characteristics of the satellite image

7) Comment

In this area including Limeca (mentioned later), volcanic rocks exist in sedimentary rocks narrowly. In comparison with general SEDEX deposits, the proportion of copper is higher than that of lead and zinc, and this area resembles an environment where volcanic massive sulfide deposits are formed rather than SEDEX deposits. Because the texture of ores has a netlike form with basic rock as

(a)



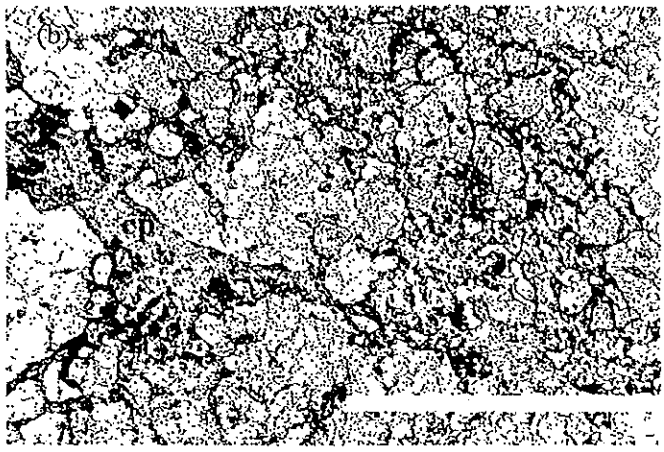
(b)

Fig.II-5-2-14-1 La Corolada deposit

(a) Surface feature of the Colorada deposit and Cobres village and (b) Gossan consisting of hematite, goethite and kaolin/dickite

(a)

(b)



(c)

Fig.II-5-2-14-2 Drill core sample (scale:1cm) and photomicrograph of the sample(scale:1mm)
(a) drill core sample of DDH-3, 74m(LC03)
(b) photomicrograph of above sample.
(c) drill core sample of DD-5, 114m(LC05)
(d) photomicrograph of above sample
(e) photomicrograph of above sample

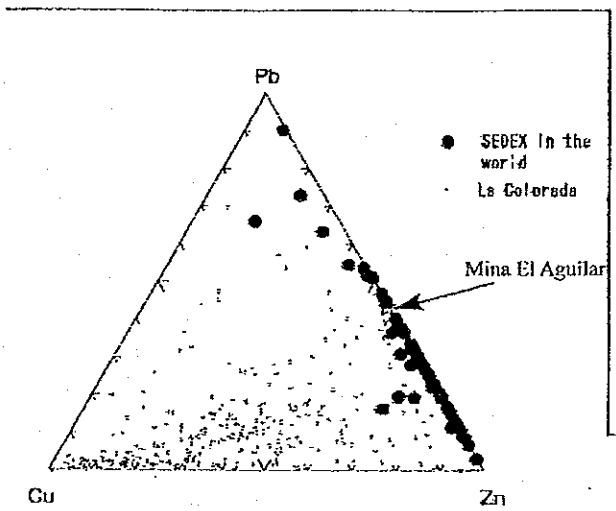


Fig.II-5-2-14-3 Cu-Pb-Zn diagram of typical SEDEX deposits (Goodfellow et al., 1993) and La Colorada deposit (Pacific Rim internal report)

gravel and because ores are accompanied by chalcopyrite, this area corresponds to the feeder zone in comparison with the typical SEDEX model (Goodfellow et al., 1993). However, it is unknown where the rubble parts exist in the whole deposits, and there is no inevitability of connecting this place to the feeder zone of SEDEX deposits. According to the results of the survey carried out by Pacific Rim Co., Ltd., this deposit has small content of useful metal and low economic value. However, it is interesting that this deposit is located in the zone accompanied by volcanic rocks, and it seems to be worthwhile to give attention to this zone in the future. In the Ordovician system about 10 km to the southwest of this deposit, Limeca bedded sulfide deposits composed of pyrite, pyrrhotite and zincblende are known (Mendez and Zappettini, 2001). Therefore, it is desired to clarify horizon hosting deposits from the viewpoint of horizen controlled deposits

5-2-15 Limeca mineral showings (Zone 18)

1) Location

At 23°41'09" S. Lat., 66°20'35" W. Long., 3,711m sea level. It is located about 5 km south east of La Colorada.

2) Access

Limeca mineral showings, is reached about several kirometer south through States Road 38 and branched from Road 38 to the west, then by walk.

3) Past surveys

No details are known.

4) Geology and tectonics

According to the reference listed the bottom, Santa Victoria group, which formed Siera de Cobre range, consists of shale, silisified rocks, quatz-biotite gneiss etc.Execpt stocks or vein of Neogene quatz porphyry andesite, there are no volcanic rocks in Ordovician sediments known.

5) Mineral showings and alteration

Some thin stratiform sulfide deposits are developed in Santa Victoria group.

6) Characteristics of the satellite image

ASTER is no available. False color image TM dosen't show any sign of mineralization.

7) Comments

Since this mineral showings is located south extend of La Colorada deposit and is also located alomost same horizon of La Corodada stratigraphically, the same type of deposits will be expected.

8) Reference materials

Mendez,V.and Mendez, Y. (2001) Limeca:Prospecto Sedex en la Puna saltena ? VII congreso Argentino de Geologia Ecomomica, Actas, Salta 2001. 107-114.

Mendez, V., Segal, S. and Zappettini, E.(2001) Depositos paleozoicos de metales base del noroeste de la Argentina: Correlacion metalogenitica y evolucion tectonica. VII congreso Argentino de Geologia Ecomomica, Actas, Salta 2001. 27-33.

5-2-16 Tusca mineral showings (Zone 22)

1) Location

At 23°40'00" S. Lat., 65°42'03.2" W. Long.

It is located about 80 km east-northeast of San Antonio de los Cobres.

2) Access

El Angosto, the nearest village to the mineral showings, is reached about 90 km through National Road 9 and 52 from San Salvador de Jujuy. To the abandoned mining place with the mineral showings, it is about 3 km from El Angosto.

3) Past surveys

No details are known.

4) Geology and tectonics

According to a geological map of Jujuy Province with a scale of 1:500,000, The Tusca mineral showings is located in an area covered by the Ordovician sediments unconformably overlying the Cambrian Meson Group. According to the inventory mentioned earlier, the Ordovician sediments is considered as sandstone and shale of the Acoite Formation.

5) Mineral showings and alteration

According to Sangster, A. L. (2001), the mineral showings comprise massive coarse-grained barite vein with a width of 1 to 2 meters, hosted by slate of the Acoite Formation. The vein shows a trend of N5° E and a vertical inclination, perpendicular to the slate bedding with a N70° W trend and a vertical dip. Small chips of chalcopyrite - galena - barite vein are observed around the place.

6) Characteristics of the satellite image

The mineral showings and its vicinity are covered by thin clouds on the ASTER images, but it is possible to read the Ordovician structure in the N-S orientation. However, no information is available which helps identify the mineral showings.

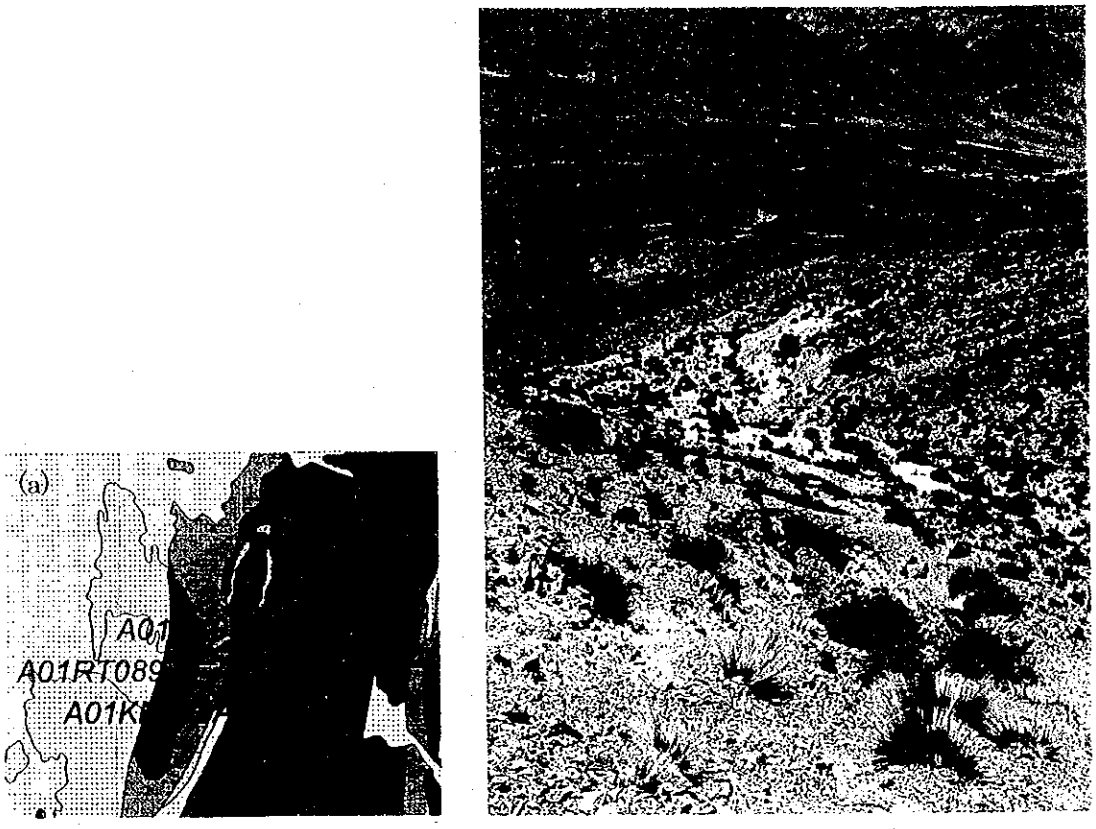


Fig.II-5-2-16-1 Tusca mineral mineral occurrence
(a) Geology around the occurrence (b) Overview of the occurrence

7) Comments

Judging from the excavated land surface, this mineral showings is not worth assessment.

8) Reference materials

No. 35, Sangster, A. L. (2001)

5-2-17 Coiruro mineral showings (Zone 24)

1) Location

At 23°44'48.2" S, Lat. 65°29'57.8" W. Long.

It is located about 50 km north-northwest of San Salvador de Jujuy.

2) Access

This mineral showings is accessed by travelling north on National Road 9 from San Salvador de Jujuy, and turning left from the stream in the north of Tumbaya town along the National Road.

3) Past surveys

No details are known.

4) Geology and tectonics

According to the inventory mentioned earlier, the geology of Coiruro mineral showings comprises the Precambrian Puncoviscana Formation, which consists of schist, slate and greywacke, and the rhyolite dykes intruding the Puncoviscana Formation.

5) Mineral showings and alteration

According to the inventory, this is considered as an epithermal Sb-Au deposit. Many adit mouths are located on the northern mountain slopes (Fig.II-5-17-1). The presence of antimonite, though small in quantity, was confirmed in gangue quartz scattering below these pit mouths. The analysis result of the other gangue quartz (A01RT090) is shown in the appendix, which gives a somewhat higher Au value of 1.63 g/t.

6) Characteristics of the satellite image

No information that characterizes mineral showings is available on the false color images.

7) Comments

Judging from the conditions of the abandoned mining places left on the soil surface, this mineral showings is not worth assessment.

8) Reference materials

(a)

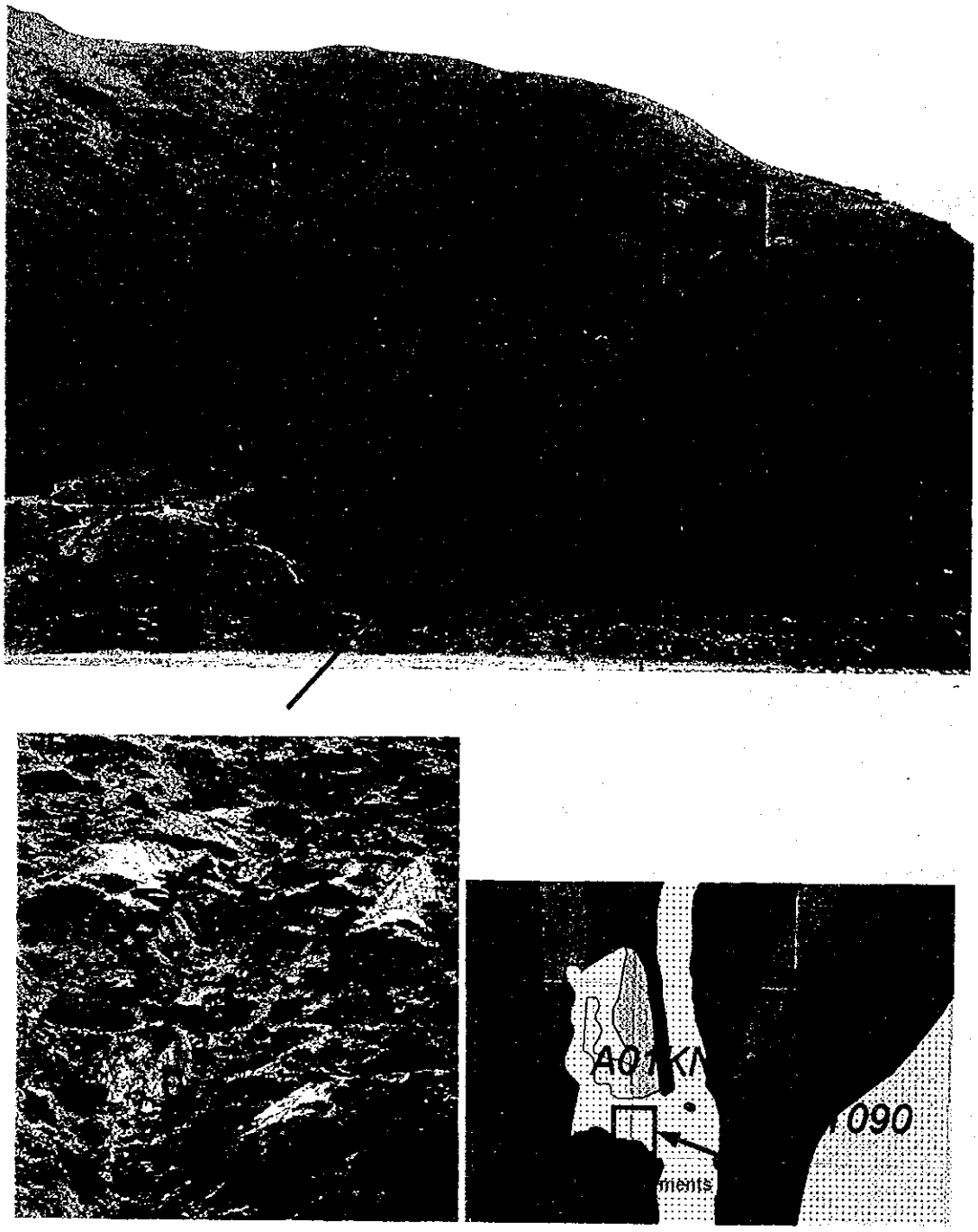


Fig.II-5-2-17-1 Coiruro mineral mineral occurrence
(a) Overview of the occurrence (b) A lot of tiny ruins explored and/or exploited
(c)Geology around the occurrence

SSM, SEGEMAR y IGRM (1999)

5-2-18 Incachule mineral showings (Zone 16)

1) Location

At 24°15' 346" S. Lat., 66°28' 11.1" W. Long. and 4,250 m above sea level (at the shaft of Vitoria Pit). This zone is located about 15 km west of San Antonio de los Cobres.

2) Access

This zone is accessible by driving a 4-wheel-drive car from San Antonio de los Cobres on Provincial Road 51. The distance is 19 km, which takes about forty minutes by car.

3) Past surveys

* 1920s: A Chilean private company mined antimony.
* 1975: FM and the World Bank carried out geological surveys, geochemical exploration (soil and rock), physical exploration (IP, magnetism and earthquakes) and boring in the government-owned area No. 31 (400 km^2 including Incachule).
* 1992 - 1995: JICA and MMAJ carried out basic surveys for cooperation in resource development.
* 1999: Aranlee Co., Ltd. prospected for gold.

4) Geology and tectonics

Ramadas Caldera and Negra Muerta Caldera exist around this mineral showings besides Aguas Calientes Caldera. It is considered that these calderas have close relation with the movements of Olacapato-El Toro Fault, which is a NW-SE oriented strike-slip fault (Petrinovic et al., 1999).

This mineral showings is located slightly inside a NNE-SSW oriented lineament, which seems to indicate the wall of Aguas Calientes Caldela of 10 to 10.5 Ma. Aguas Calientes Volcano is a resurgent caldera, and it is deemed that there was effusion of dacitic ignimbrite four times; Verde ignimbrite, Chorrilos ignimbrite, Tajamar ignimbrite and Abra del Gallo ignimbrite (Petrinovic et al., 1999). It belongs to the calc-alcali magma system of the island-arc and back-arc types.

5) Mineral showings and alteration

Ignimbrite is distributed inside Aguas Calientes Caldera. Many places of mineral showings with this ignimbrite as wall rock are known, including La Poma (Pb), Tauro (Ba), La Olividada (Pb), La Victoria (Sb), Incachule (Sb), California (Pb) and Neptuno (Mn). Among them, a mineral showings covered by this survey is Incachule where mineralization of antimony is known. In the low-sulfide epithermal system, antimony generally tends to thicken in the shallow part. According to JICA and MMAJ (1993), although the grade of gold is low, this whole place received alteration of neutral hot water, and 166℃ is shown as the filling temperature of fluid inclusion of quartz in brecciated quartz veins. For these reasons, it was determined that the aim should be checking the

probabilities of existence of epithermal gold deposits in the vicinity and the lower part.

Verde Ignimbrite (A01KN018) which is andecite with weak and no alteration of quartz and looks dark gray and biotite phenocryst are characteristic. It is found from a microscopic examination that phenocryst is comprised of quartz, plagioclase, potassium and biotite and that the matrix is made up of quartz and feldspar cryptocrystalline and microcrystalline. Biotite is remarkably opacite and opaque minerals are produced around biotite. Rocks altered to white clay are divided into two groups: those that develop around quartz veins (hydrothermal breccia) (Fig. II-5-2-19-1) and those that are not accompanied by hydrothermal breccia. The former looks brown because biotite has altered completely, and is accompanied by limonite. It was found from the result of X-ray diffraction of samples (A01KN020 and A01kn025) of altered rocks of this type, which were collected in two places, that the altered minerals are quartz, potassium, and smectite and sericite mixed-layer minerals. The latter has survival of biotite and quartz but plagioclase and the matrix have altered to clay (A01KN016). The result of X-ray diffraction shows that the altered minerals are quartz, potassium and sericite (A01KN016 and A01KN017). Composition of altered minerals indicates formation at higher temperature than the former. The combination of quartz and kaolin was confirmed at the east and west ends of this alteration zone (A01TK015, A01TK016 and A01KN022). It seems to be overprint of acid hot water. Quartz veins (hydrothermal breccia) are formed by quartz which combinated solidly quartz (silicified rock), and leached and silicified ignimbrite crust and quartz generally looks milk white. The maximum width is about 30 cm. The quartz veins are accompanied by stibnite. The length of some single crystals of stibnite is as long as almost 10 cm. NW-SE oriented quartz veins are dominant. According to JICA and MMAJ (1993), eight quartz veins have been confirmed. Fig. II-5-2-19-1 shows two quartz veins accompanied by alteration to white clay that develop in dark gray ignimbrite (Veta-4 and Veta-5). The result of chemical analysis gave the following values: Au of 1.26 g/t in a quartz vein sample (A01KN024) and As>10,000 ppm in A01KN023. Antimony has Sb of 105 to 760 ppm.

There is formation of a silica sinter that has alteration to white clay, gush of a hot spring and manganese oxides about 3 km to the south of this mineral showings. From the result of chemical analysis of the sinter, no abnormal thickening of metallic elements was observed particularly (A01KN027).

6) Characteristics of the satellite image

On the ASTER 3D image (Fig. II-5-2-19-2), Incachule Alteration Zone on and inside the caldera wall can be clearly identified. The outside of the caldera presents an ocherous color tone and the west side shows blackish brown tone on the false color image. The former corresponds to Tajimar Ignimbrite and Abra de Gallo Ignimbrite, and the latter to Verde Ignimbrite.

7) Comments

The alteration zone with alteration to clay surrounding this mineral showings is located in the caldera wall as assumed from the satellite image. It is presumed that this zone was formed by the

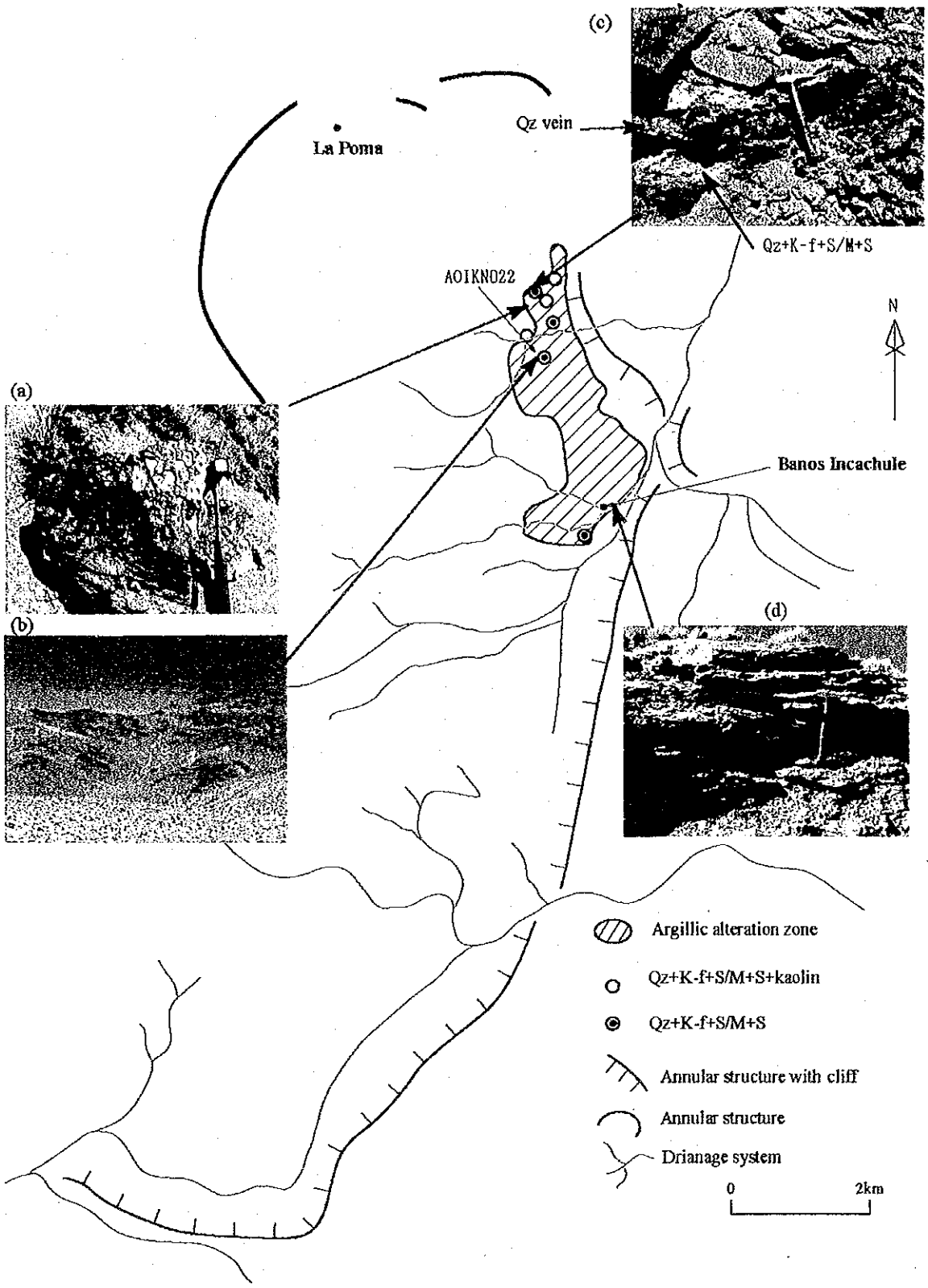
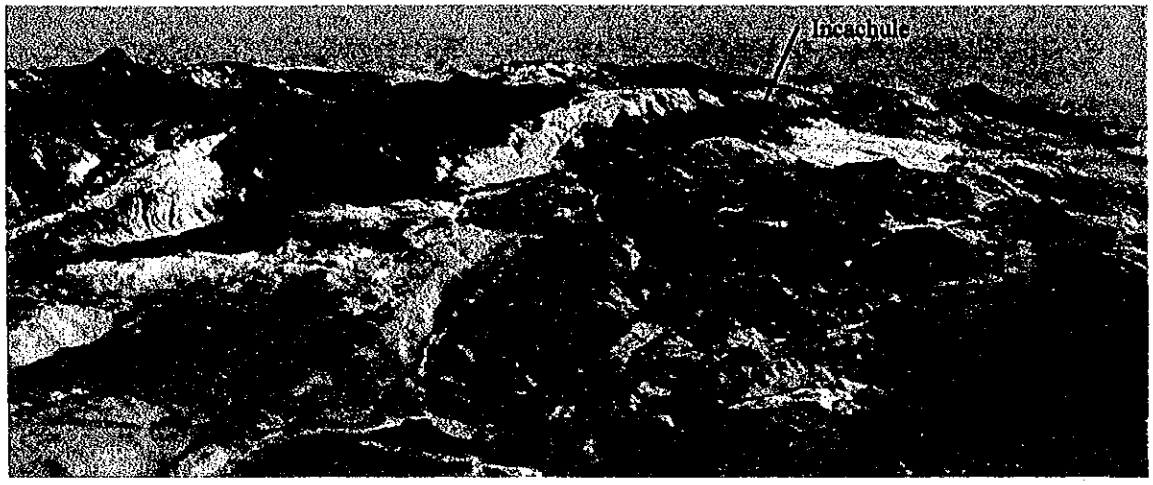
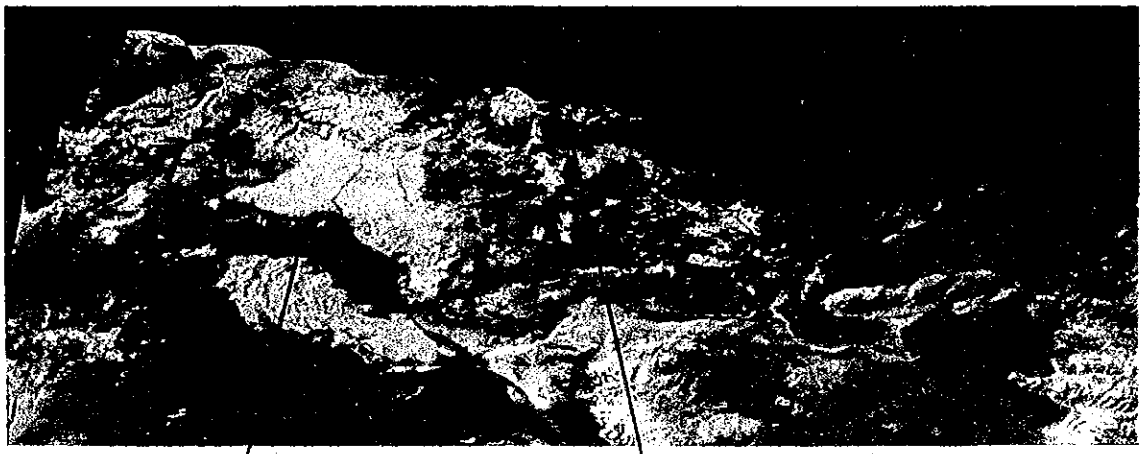


Fig.II-5-2-18-1 Incachule mineral occurrence (a) hydrothermal breccia (b) argillic alteration zone

ASTER image 012



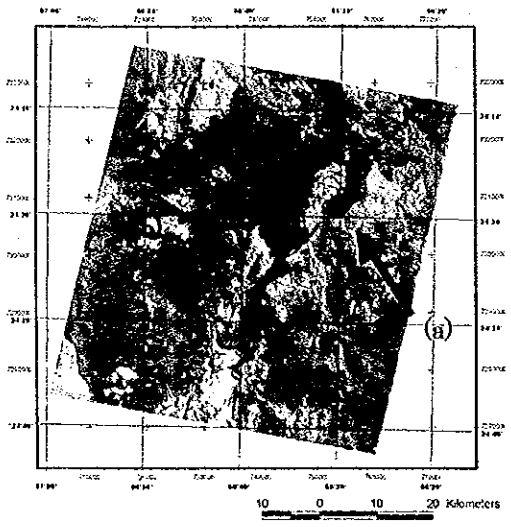
(a)



(b)

Incachule

Organullo



FigII-5-2-18-2 Birds-eye view of Incachule occurrence and Organullo occurrence

hydrothermal system that generated in fracture of the caldera wall in the post-caldera period. Its hydrothermal activities have continued by the present time as known from Bano de Incachule Hot Spring. Judging from composition of altered minerals and fluid inclusion filling temperature, on the assumption of low-sulfide gold deposits, the precipitation level of gold is considered to be deeper than the present ground surface. Therefore, it is desired to clarify the hydrothermal system including extraction of places where hot water focuses.

8) Reference materials

5-2-19 Organullo mineral showings (Zone 27)

1) Location

This place is located about 20 km southwest of San Antonio de Los Cobres in Los Andes County, Salta State, at lat. 24°23' 44.1"S, long. 66°19' 17.1" W (Organullo mine) and about 4,000 m above sea level.

2) Access

This place is accessed by driving 35 km from San Antonio de Los Cobres southwestward on a local road, which is unpaved but maintained well. It takes about one hour.

3)Past surveys

* - 1960: Small-scale underground mining (ore reserves: 30,000 t, 2 g/t Au, 0.09 % Bi).

* 1970s: A geological sketch map was prepared from mineral resource exploration of the Plan NOA I (Reserva No. 26) carried out by the Army Arsenal and the Mining Bureau of the State. Geochemical exploration (71 samples) was executed. In addition, IP exploration and drilling investigation (500 m in total) were carried out in Organullo Norte and litho-geochemical exploration (97 samples) was done in Organullo Sur (Viera O., 1975). Good results leading to the next survey were not obtained from these surveys.

* 1996: Triton Co., Ltd. carried out drilling investigation in Organullo Norte and the highest value obtained was 1.2 g/t of Au. The mining right is now owned by Minera Aconcagua S. A.

4) Geology and tectonics

This mineral showings is located in the eastern part of Puna, and is comprised of metasediments and metamorphic rocks (Puncoviscana formation), Ordovician to Silurian granodiorite (Complejo Eruptivo Oire), Cretaceous sedimentary rocks (Pirgua formation) and Neogene volcanic rocks.

Puncoviscana formation of the upper Proteozoic forms basement rock of Puna in this place, and comprises slate, schist, phyllite, graywacke and quartzite. A cleavage plane or stratified bedding plane develops and comes off easily in the laminar form. The complex of the Ordovician to the

Silurian is widely distributed in the western part of this area. It is composed of granodiorite and migmatite, both of which contain macro crystals of feldspar, and forms the rock body of the batholith scale. Although the detailed age is unknown, this complex intrudes into the Lower to Middle Ordovician system but has not affected Upper Cretaceous limestone.

Upper Cretaceous Pirgua formation is distributed in the northwestern part of this area, and is made up of a conglomerate sequence originating in Puncoviscana formation and Complejo Eruptivo Oire. This layer is exposed along a N-S tending tectonic graben zone of 150 to 200 m in width.

Neogene volcanic rocks are composed of greenish gray ignimbrite, dacite and andesite, and cover this area widely according to old geography. In connection with these volcanic rocks, as a N-S tending intrusive rock body intrudes into Proterozonic and volcanic rocks, it is considered that the intrusive rock body formed a volcano bottom rock body of the volcanic system, which was torn off. Although it is difficult to determine the source rock of this intrusive rock body because of strong alteration, the source rock is presumed to be dacite that is considered to have brought about mineralization in this area.

In this area, there is development of N-S to NS-SE tending highly-angled fault systems formed by Andes Cycle Orogenic movement. These fault systems appear in cliffs and ravines characteristically. This area is included in Reserva No. 26 of Plan NOA I.

5) Mineral showings and alteration

In this mineral showings, several vein-type deposits are known, including Organullo Deposits (Au, Bi, Cu, Pb and Zn, alias Julio Verde Mine?), Diana Deposits (Pb) and Torca Deposits (Pb and Ag). This whole mineral showings is roughly divided into Organullo Norte and Organullo Sur. Abandoned Organullo Mine has a mine entrance along a valley on the west side of Organullo Norte.

The Abandoned Organullo Mine is polymetallic vein deposits and was mined as a quartz vein hosted in metasediments in the Puncoviscana formation. Mineralization has extended to quartz veins and surrounding wall rock, and pyrite, chalcopyrite, galena, sphalerite and bismuthinite are observed in the impregnated form. Gold is considered to be contained in pyrite. Wall rock at the edge of the vein has received strong silicification. From chemical analysis of ore samples (A01RT036) of quartz veins of this mine, the following results were obtained: Au: 2.86 g/t, Bi: 1,600 ppm, Cu: 1,530 ppm, Pb: 640 ppm and Zn: 320 ppm. Based on the observation of polished thin section of the same samples, they were judged to be brecciated and silicificated rock ores containing pyrite. A large amount of quartz, a small amount of sericite as secondary mineral, and a large amount of pyrite as mineral ore were identified. These ores are remarkably brecciation, and it is considered that the ores received silicification and pyritic alteration after brecciation, and then quartz filled vacant spaces. A small amount of sericite is accompanied by last-stage quartz. The following values were detected as a result of chemical analysis: Au: 5.38 g/t, Bi: 1,300 ppm, Cu: 3,570 ppm, Pb: 480 ppm and Zn: 260 ppm.

Organullo Norte is the upper zone, including the same mine. This area has a geology of

widely distributed greenish gray ignimbrite, covering Puncoviscana formation at an unconformable dip. In the area about 1 km to the north of this mine, there is intrusion of intrusive rocks of the volcano bottom type that are surrounded by ignimbrite. It is presumed from their N-S tending form that these rocks extend southward. An alteration zone has total length of 4 km and width of 1 km and surrounds the intrusive rock body. This zone has development of silicification argillization, sericitic alteration and chloritization. Silicified rocks are often impregnated by pyrite, chalcopyrite and the leached portion shows the box work form. In samples of grayish green ignimbrite (A01RT038), phenocryst of quartz, biotite, feldspar and chlorite are observed. The samples were concluded through the polished thin section as dense welded tuff. Identified minerals are a large amount of plagioclase and biotite, a moderate amount of quartz and potassium feldspar, and a very small amount of zircon, while, as secondary minerals, there are a moderate amount of chlorite, sericite, and smectite, and a small amount of calcite. Whitely silcified or argillized rocks (dacite/andesite?) (A01RT039) are impregnated by limonite. From X-ray diffraction, a large amount of quartz, sericite/smectite mixed layer minerals, and a moderate amount of Na-alunite were identified. Similarly, samples of whitely silicified/argillized rocks (dacite/andesite?)(A01RT040) were impregnated by limonite. Minerals detected from X-ray diffraction are a large amount of quartz and a moderate amount of kaolinite. Near the point where Sample A01RT040 was collected, it was observed that a breccia vein (N 10° W) accompanied by limonite impregnation of 2 to 3 m in width intruded into silicified or argillized wall rocks (dacite/andesite?). In Organullo Norte, there are many holes of drillings (1,900 m in total) carried out by Triton Co., Ltd. in 1996, and cuttings are placed near these holes, but the result is not decisive.

Organullo Sur is located about 5 km to the south along the same mountains as Oranullo Norte. Dacitic volcanic rocks are distributed, covering Puncoviscana formation and Pirgua formation. On the north side, these rocks are intruded by andesitic intrusive rocks accompanied by pyrite impregnation of 2 km in total length and 200 m in width. The presence of small-scale dioritic stock has been confirmed. While cumulate alteration zones have not been confirmed, there is a wide and uniform spread of silicification, argillization sericitization, biotitic alteration, kaolinization, chloritic alteration, epidotic alteration, calcitic alteration and limonitic alteration on ground surface. Samples of silicified or argillized rocks (A01RT041) have advanced alteration. Although identification is difficult, in the polished thin section, these were considered to be andesitic porphyry?. Minerals identified in the judgement are a very large amount of plagioclase, a large amount of quartz, a moderate amount of biotite, a small amount of potassiuim feldspar, and a very small amount of apatite, while identified secondary minerals are a small amount of chlorite, sericite, smectite and opaque minerals. It was concluded by the polished thin section that samples (A01RT042) of greenish gray andesite were strongly silicified dasitic tuff. Minerals identified in this polished thin section are a very large amount of quartz, a large amount of plagioclase, a moderate amount of potassium feldspar, a small amount of biotite and a very small amount of apatite, while secondary minerals identified are a large amount of chlorite, a moderate amount of smectite, a small amount of sericite and a moderate amount of opaque minerals. Near the point where Sample A01RT041 was collected, hydrothermal breccia containing

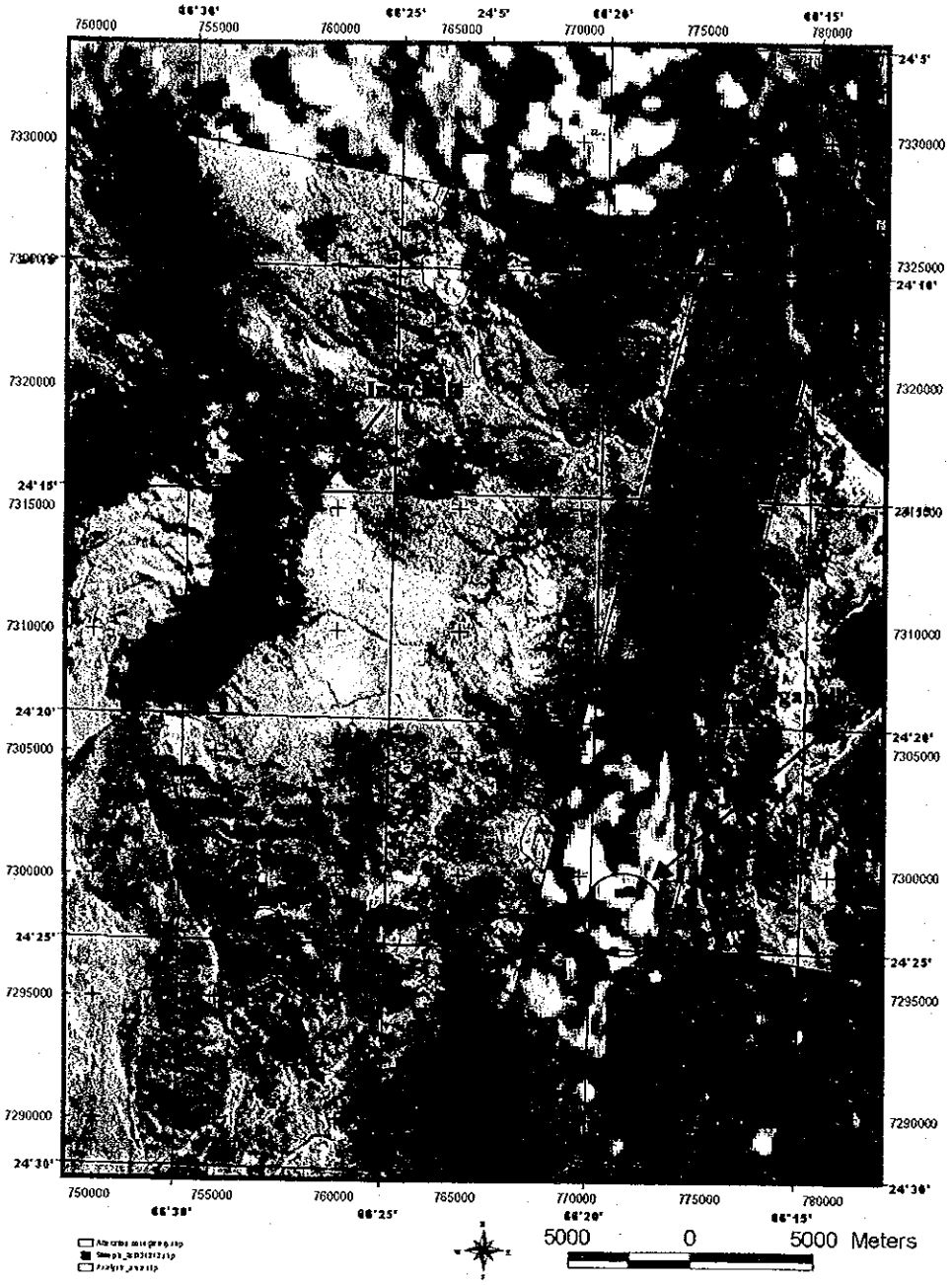


Fig.II-5-2-19-2 Organullo mineral showing and Incachule mineral showing (ASTER BGR=147)

many gravels intrudes into silicified or argillized tuff with development of bedding. Due to silicification and argillization, impregnation of limonite was observed.

6) Characteristics of the satellite image

7) Comment

In this area, as there is a polymetallic vein deposit (abandoned Organullo Mine), and the presence of porphyry gold/copper deposits related to this can be expected. For Organullo Norte, a drilling investigation (1,900 m) was carried out by Triton Co., Ltd. but the details are unknown. For Organullo Sur, only litho-geochemical exploration of 97 samples was executed, and it is hard to say that the details of mineralization and alteration zones have been surveyed. Detailed surveys are desired.

5-2-20 El Acay mineral showings (Zone 27)

1) Location

At 24°30'20.1" S, Lat., 66°11'07.2" W. Long. and 3,910 m above sea level. About 30 km southwest of San Antonio de Los Cobres.

2) Access

Access is made by travelling on National Road 40 from San Antonio de Los Cobres to Cachi, driving over Acay Pass at 4,895 m above sea level and then about 7 km farther southward. These are unpaved and very steep mountain roads that need switchbacks repeatedly.

3) Past surveys

1990s: Some mining operations seem to have been carried out.
1970~1975: Surveys were conducted by Fabricaciones Militares.
1996: Prospecting was conducted by Aranlee Resources Ltd.
1997: Prospecting was conducted by RTZ.

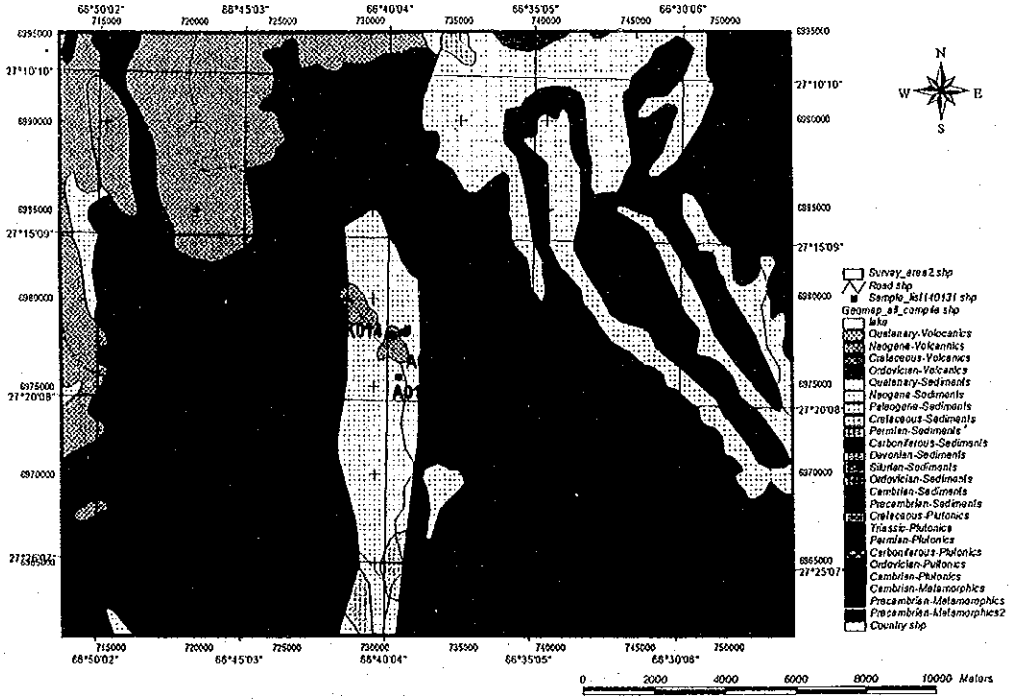
4) Geology and tectonics

The bedrock of mineral showings is of the Puncoviscana group in the Precambrian, and it has in addition a distribution of Cretaceous and Neogene sedimentary rocks. These are intruded by dacite volcanic rocks representing the Miocene. Viewed on the whole, the geology assumes a north-and-south oriented tectonics.

5) Mineral showings and alteration

The mineralization is a polymetallic deposit of lead - zinc - gold - silver in quartz veins accompanied by dacite volcanic rocks. According to the 1974 survey conducted by Richard Sillitoe, a

El Acay occurrence



(a)

(b)

FigII-5-2-20-1 El Acay occurrence
(a) sample point, (b) perspective view

consultant, there is a porphyry copper deposit in the depths.
(http://usuarios.arnet.com.ar/lapacha/Pagina3.htm#acay). The result of an X-ray diffraction detected Sericite, Kaorinite (A01RT033, A01RT034) and a Sericite/Smectite mixed layer (A01KN011).

6) Characteristics of the satellite image

For this mineral showings, although an alteration from white to red was observed in the field survey, the false color images of Landsat TM showed no alteration zones. The distribution of bedrock Puncoviscana group is shown in a dark brown color in the false color images, but it is not shown clearly enough. Also, while new volcanoes are shown in a whitish color, they do not quite agree with the distribution on the map.

7) Comments

Since the survey of geology, tectonics and mineralization has many areas where research is incomplete, more detailed studies including geophysical prospecting are desired.

8) Reference materials

5-2-21 Pancho Arias mineral showings (Zone 28)

1) Location

At 24°15'56.0" S, Lat., 65°50'53.7" W. Long., 3,506 m above sea level, and about 70 km northwest of Salta.

2) Access

Access is made by travelling on National Road 51 from Salta to San Antonio de Cobre and driving about 19 km on the valley road branching from Pucrta Tastil, located about 60 km from Rosario De Lerma to the southwest of Salta.

3) Past surveys

About 1700: Discovered by a prospector visiting this place with a missionary.
About 1950~60: Surveys were conducted by Fabricaciones Militares.
1972: A copper-molybdenum deposit was discovered by the NOA 1 program of FM.
1973-75: A drilling exploration using ten bore holes (1,716 m in total length) was carried out and, consequently, 230 mil. tons of 350 ppm/t molybdenum grade mineral deposit was discovered. Also, it is reported that a drilling exploration by two bore holes resulted in the discovery of a max. 1.5% copper grade deposit, and that an IP exploration discovered sulfide mineral anomalies at depths of about 300 m.

About 1995: Aranlee Resources Ltd. carried out a detailed survey and confirmed that the deposit is of a typical molybdenum porphyry type. It is reported that the central part of the deposit is a

typical K-silicate alteration surrounded by phyllic (Quartz-Sericie-Pyrite) alteration, and that the mineralization mainly occurs in the quartz stock work zone.

4) Geology and tectonics

Around this mineral showings, Precambrian Puncoviscana group extending in a N-S orientation in a wider range is widely distributed together with plutonic rocks of Cambrian spreading in its center. The mineral showings is accompanied by dacite poryphyry (partially consisting of andesite, monzonite, diorite) of Tertiary (15 Ma) intruding into Puncoviscana group. The largest rock has a circular shape somewhat extending in the NE-SW direction with a major diameter of 1.3 km and a minor diameter of 0.8 km. A group of dikes runs in other directions.

5) Mineral showings and alteration

The mineralization is a typical porphyry type copper and molybdenum mineralization and accompanies chalcopyrite, chalcocite, covelline, galena, etc. The largest of the alteration zones (No. 298, with an area of about 1.96 km^2) shows the alteration zoning of a K-silicate alteration zone at the center surrounded by phyllic (Qz-Sericie-Pyrite) alteration zones and further surrounded by a propylitic alteration zone at the outermost periphery.

As a result of the sample analysis, a fluid inclusion homogenization temperature of 511 - 540°C and salt concentration of 61.3 - 65.3, Nacl eq% was obtained.

6) Characteristics of the satellite image

Alteration zones are distinguishable at three places (alteration zone Nos. 298, 299 and 302) with the largest of these showing zonal structure as mentioned above. The other two are small in scale and distributed to its northwest side. Both show a light green color on ASTER false color images. The largest alteration zone seems to have its weak alteration remaining on the center top and its strong alteration looking like a doughnut. On color-ratio composites, that alteration zone is shown in a white color and, on the iso-grain model images, in a red color which indicates alunite to the result of clear discrimination.

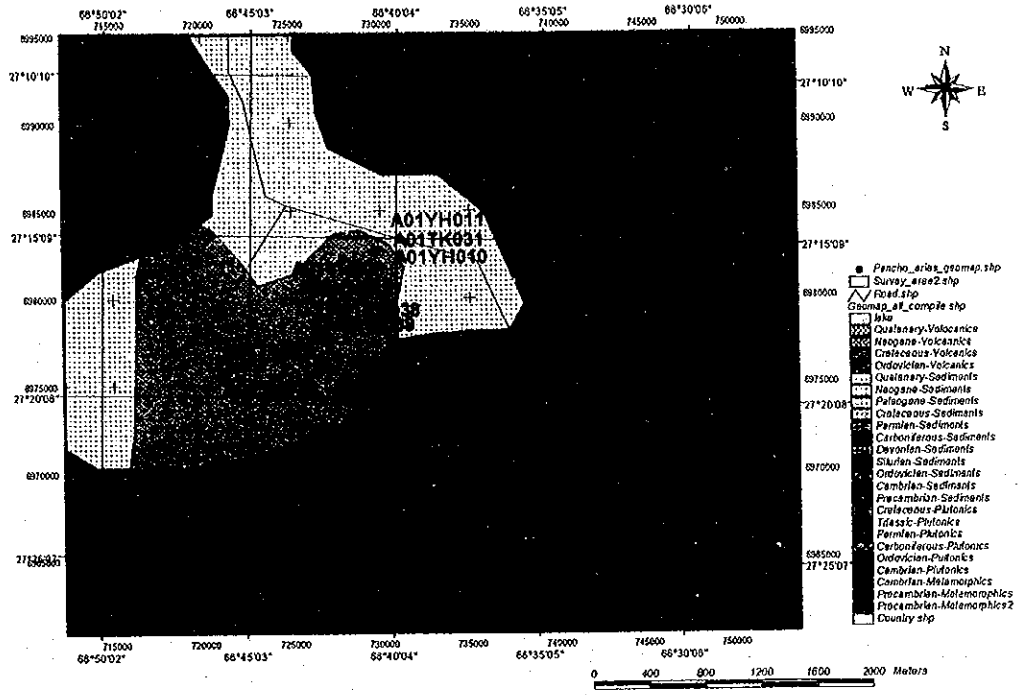
In addition, a subsidence structure (major axis of about 9 km by minor axis of about 5 km) is observed extending in the NE-SW direction in the plutonic rock distribution area located about 7 km to the south of this mineral showings. Further, in its southwestern extension, small alteration zones are scattered over an area of about 10 km.

7) Comments

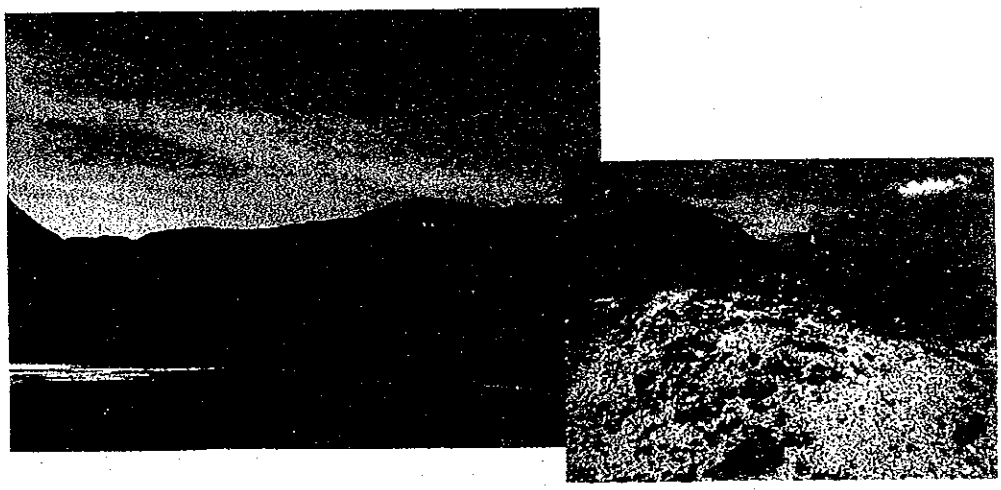
This is a typical porphyry type deposit and accompanies the primary sulfides of copper and molybdenum. Recently, an exploration was carried out by Aranlee Resources.

8) Reference materials

Pancho Arias occurrence



(a)



(b)

(c)

Fig. II-5-2-21-1 Pancho Arias occurrence

(a)sample point, (b)perspective view, (c) white alteration

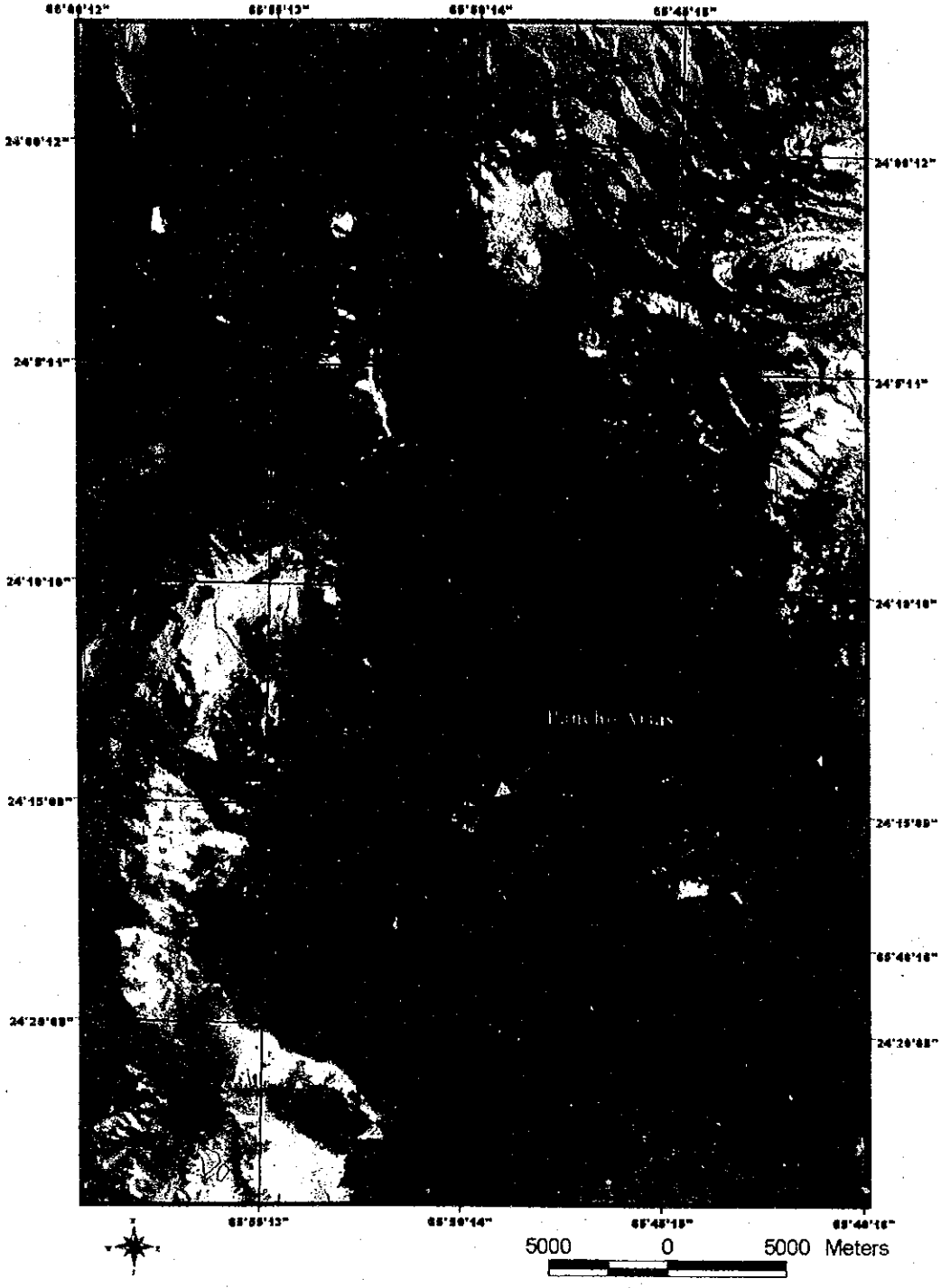


Fig.II-5-2-21-2 Pancho Arias occurrence(ASTER203)

5-2-22 Centenario mineral showings

1) Location

At 24°50'28.9" S, Lat., 66°48'00.6" W. Long., 4,280 m above sea level and about 140 km practically directly west of Salta, Los Andes County, Salta state.

2) Access

Access is made by travelling on the unpaved road going south from San Antonio de los Cobres, driving northwestward about 2.6 km on the unpaved road branching from the west of Salar Centenario, a salt lake, to the north side (Centenario North) of the mineral showings and, then, further driving about 3 km to the south side (Centenario South). For this journey, a 4-wheel-drive car is essential. This place is located about 21 km to the northwest of Vicuna Muerta.

3) Past surveys

1971, 1973: Geochemical and geophysical surveys were conducted by Fabriciones Militares.
1994~95: A drilling survey was carried out by Aranlee Resources Ltd. (Centenario North).
2001~: Lapacha Minera SRL conducted geological, geochemical and drilling surveys on two places of porphyry mineral showings, and confirmed strong anomalies especially in porphyry rocks in the south.

4) Geology and tectonics

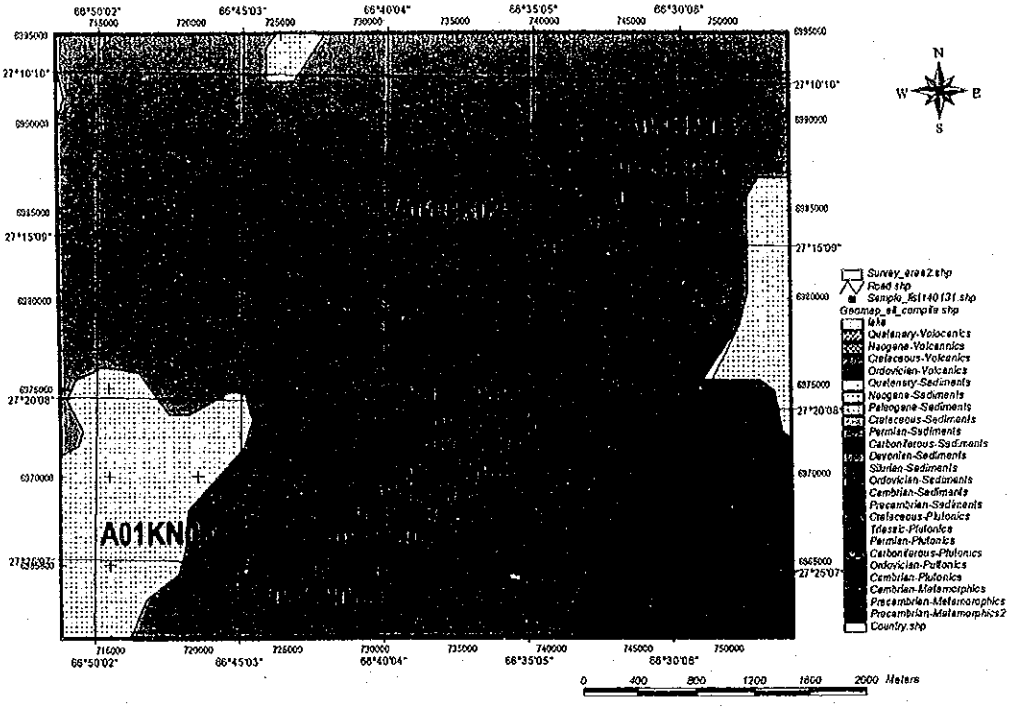
This mineral showings runs along the fault in the direction of NE-SE and is made up of Ordovician phyllite on the west side of the fault and, on the east side, made up of Precambrian crystalline schist accompanying pegmatite. The mineral showings is two dacite porphyry rocks intruding along this fault with its north side called Centenario North (Alteration zone 238) extending over about 0.9 km in length and 0.2 km in width and with its south side, called Centenario South (Alteration zone 232), extending over about 2.9 km in length and 0.80 km in width. Both intrusive rocks are structurally brecciated and develop a stock work condition. The breccia indicates dacite, andecite and rhyolite.

5) Mineral showings and alteration

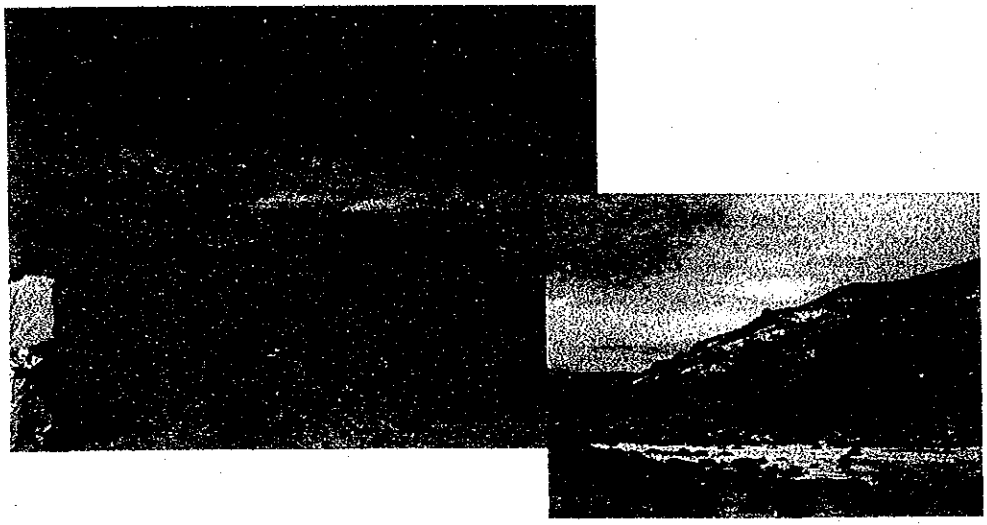
The mineralization is that of hydrothermal gold - silver (- lead - copper - molybdenum - tin). The mine property is divided into four sections (1,200 ha in total area) that are now owned by Lapacha Minera SRL.

In Centenario North, breccia, containing dacite, andesite and rhyolite, is being silicified. On the other hand, in Centenario South, breccia contains andesite and turmaline. The exploration conducted by Aranlee Resources Ltd. reports the detection of 0.4 g/t of gold from the sample taken in Centenario North, the result of a drilling test verifying a higher grade of gold as mining progresses southwestward and to the greater depths, the accompaniment of strong IP anomalies in Centenario South and an increase in gold grade up to 0.64 g/t in the area of the anomalies.

Centenario occurrence



(a)



(b)

(c)

Fig. II-5-2-22-1 Centenario occurrence
(a)sample point, (b)perspective view, (c) white alteration

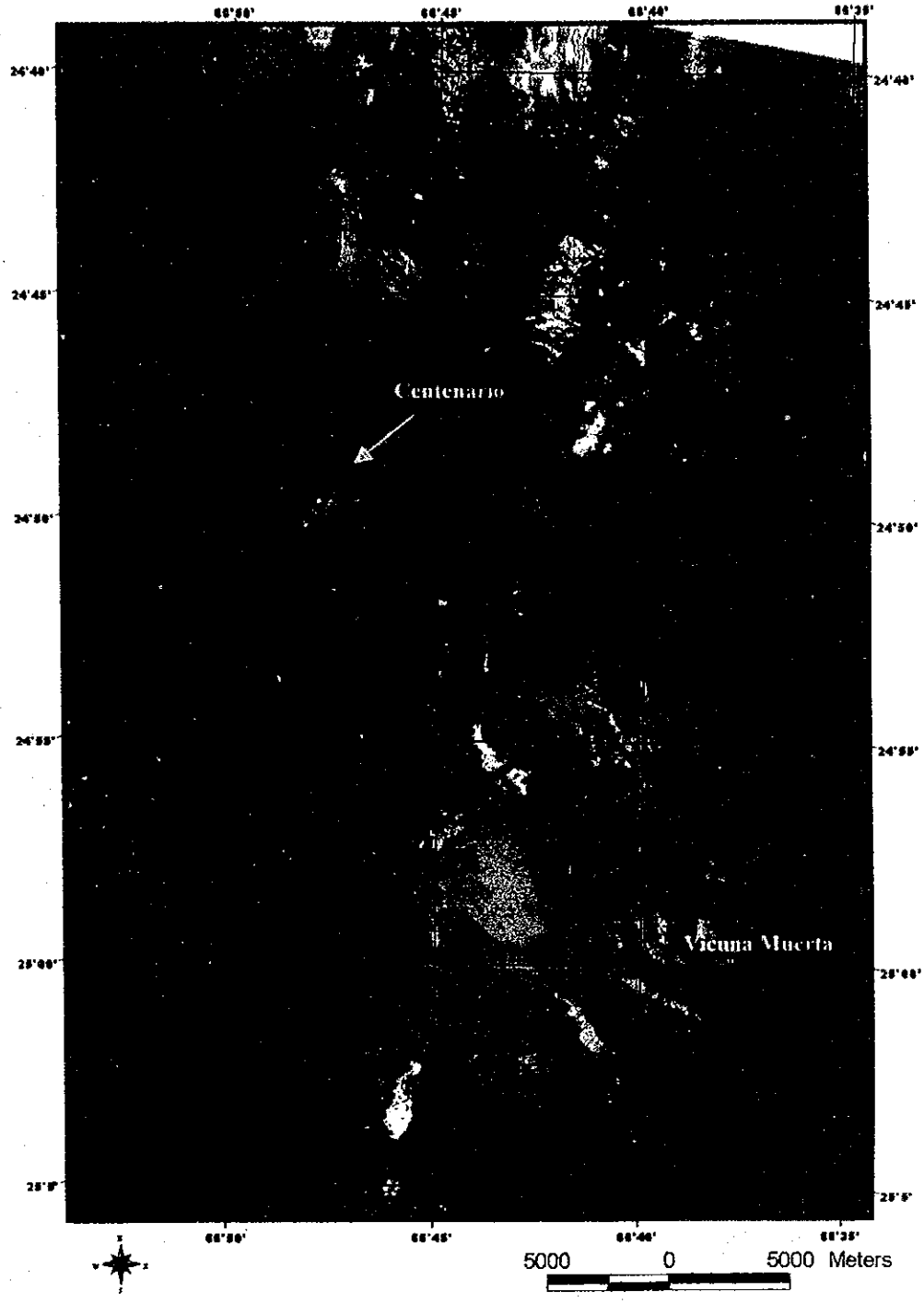
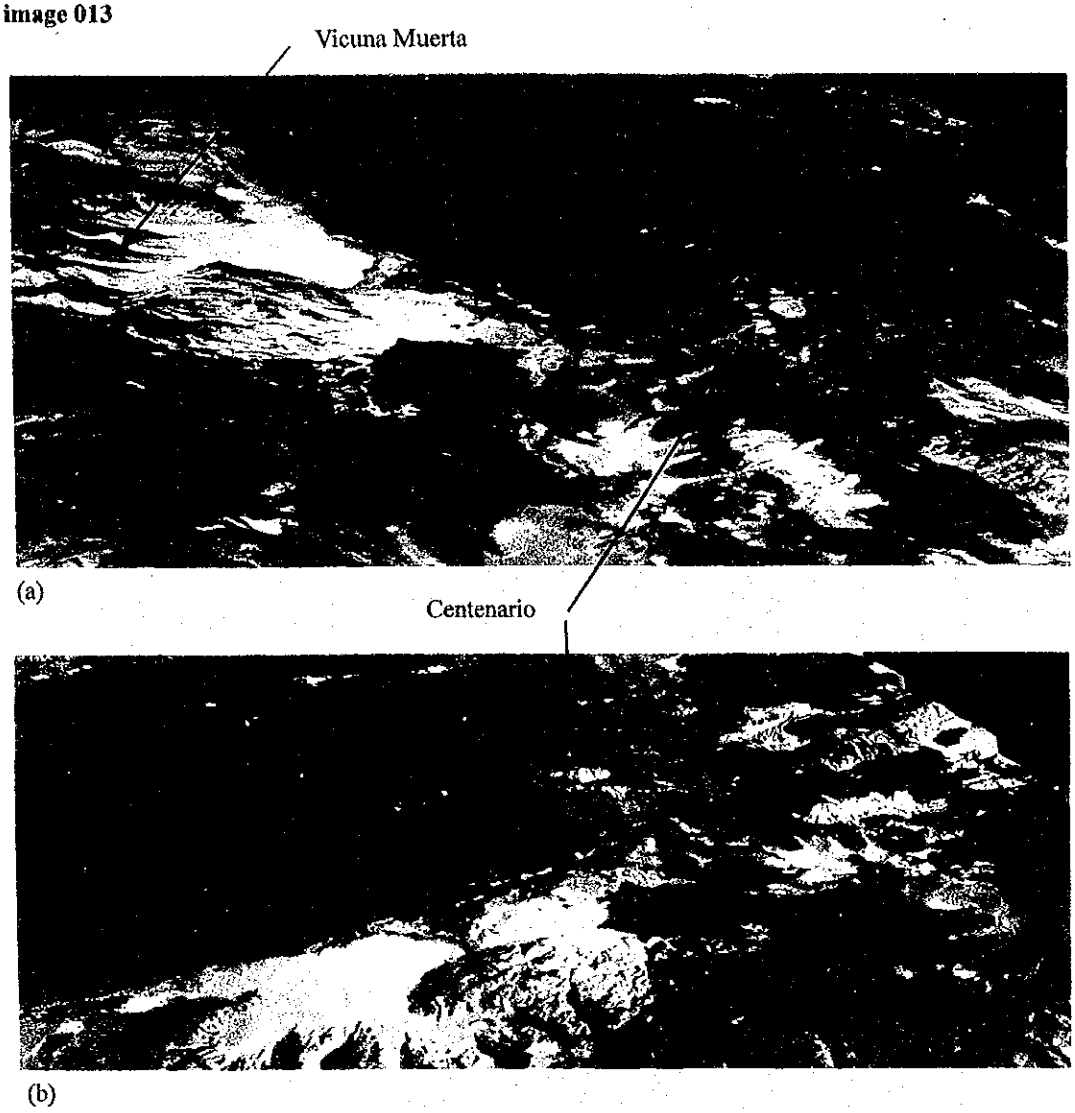


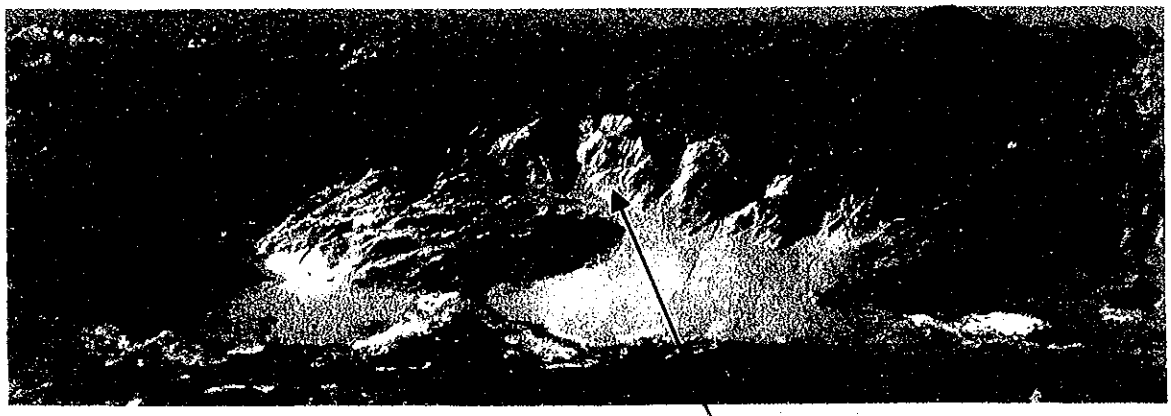
Fig.II-5-2-22-2 Centenario occurrence (ASTER013)

ASTER image 013



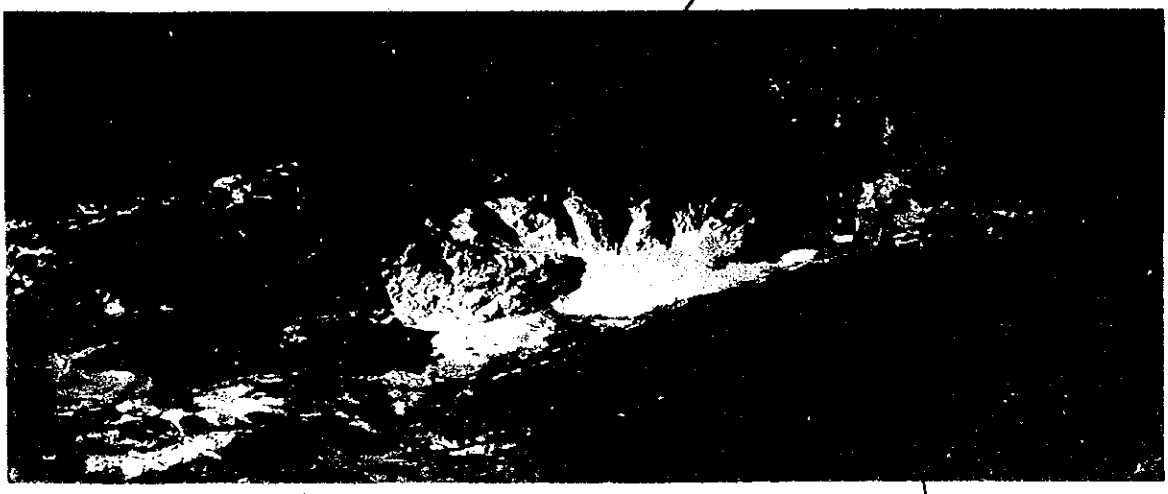
FigII-5-2-22-3 Birds-eye view of Centenario occurrence

ASTER image 013

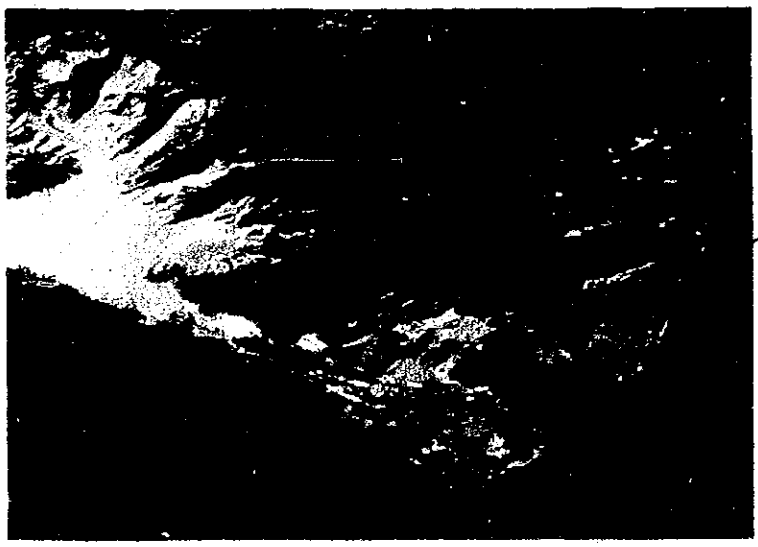


(c)

Vicuna Muerta



(d)



Inca Viejo

(e)

FigII-5-2-22-4 Birds-eye view of Vicuna Muerta occurrence and Inca Viejo occurrence

(Americas Mining News July 9, 1997: www2.cdn-news.com/newsnet/1998/12/30/1230029n.htm)

In the fields of both mineral showings, alteration from white to reddish brown is observed, and Alunite and Jarocite are observed in quantities. Especially, Jarocite is characteristically veiny and distribute in quantities. The sample analysis detected Alunite, Kaolinite, Jarocite, Pyrophllite, Sericite, Chlorite, Gypsum, etc. from clay and breccia (A01RT052, 054, A01TK025) in Centenario North, and Alunite, Jarocite, Pyrophllite, Sericite, etc. from breccia (A01TK026, A01RT057) in Centenario South.

6) Characteristics of the satellite image

Both Centenario North and Centenario South develop a light green color on ASTER false color images. They show a red color on the iso-grain model images to indicate Alunite. Thus, they are clearly distinguishable. Further, on both images, a distribution, though small in scale, of similar tone of color is caught on the southwest extension of Centenario South over the range of about 10 km (alteration zones 216, 219, 220, 221, 223, 225 and 227), which suggests that alteration is progressing along the southwest extension of the fault. Also, it is tectonically interesting to note that a bigger alteration zone 247 (about 8.8 km^2) is distributed in the north of this mineral showings, and that alteration zone 246 is also distributed in the northeast extension of this mineral showings.

7) Comments

This mineral showings has been extracted as an alteration zone by ASTER. In recent years, exploration was carried out by Lapacha Mineral SRL in this place.

8) Reference materials

5-2-23 Vicuna Muerta mineral showings (Zone 31)

1) Location

At 25°0'39.3" S, Lat., 65°40'5.6" W. Long., 4,300 m above sea level and about 130 km to the west-southwest of Salta.

2) Access

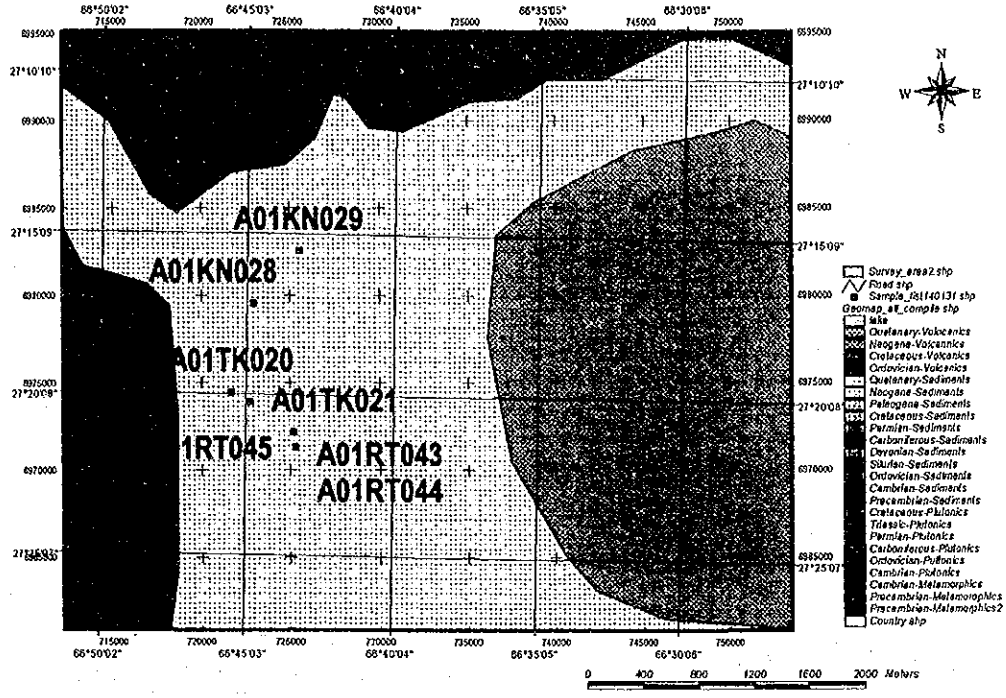
Access is made by travelling on the unpaved road going south from San Antonio de Cobres, passing to the west of Salar Centenario, a salt lake, and going about 10 km farther to the east by 4-wheel-drive car on the unpaved road branching from the mid-point to the southern salt lake of Salar Ratonespono.

3) Past surveys

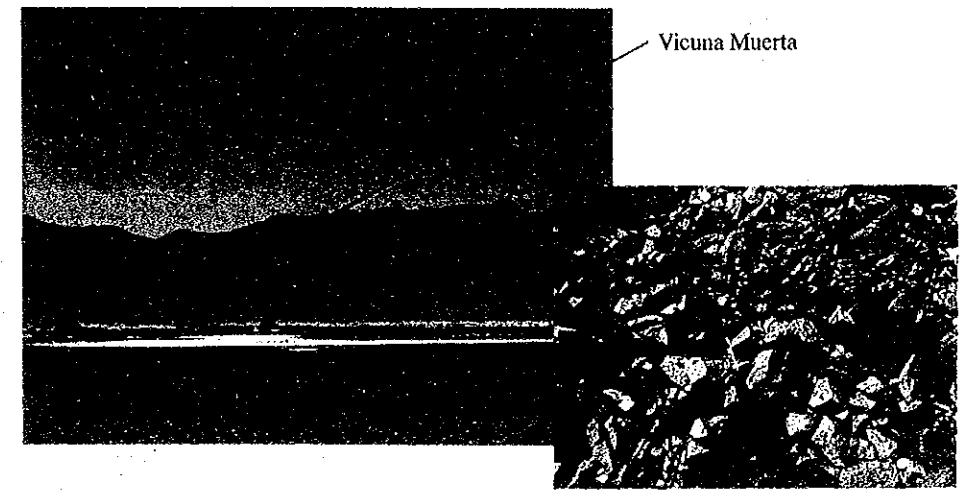
199?: SEGEMAR read the photogeology and conducted a geochemical exploration of the streams and sandy soil, and identified a ring structure of about 6 km diameter from Landsat images.

1970-71: As a result of a wide-range geochemical exploration, a clear anomaly of Pb was

Vicuna Muerta occurrence



(a)



(b)

(c)

Fig. II-5-2-23-1 occurrence
(a) sample point, (b)perspective view, (c)granitic rocks

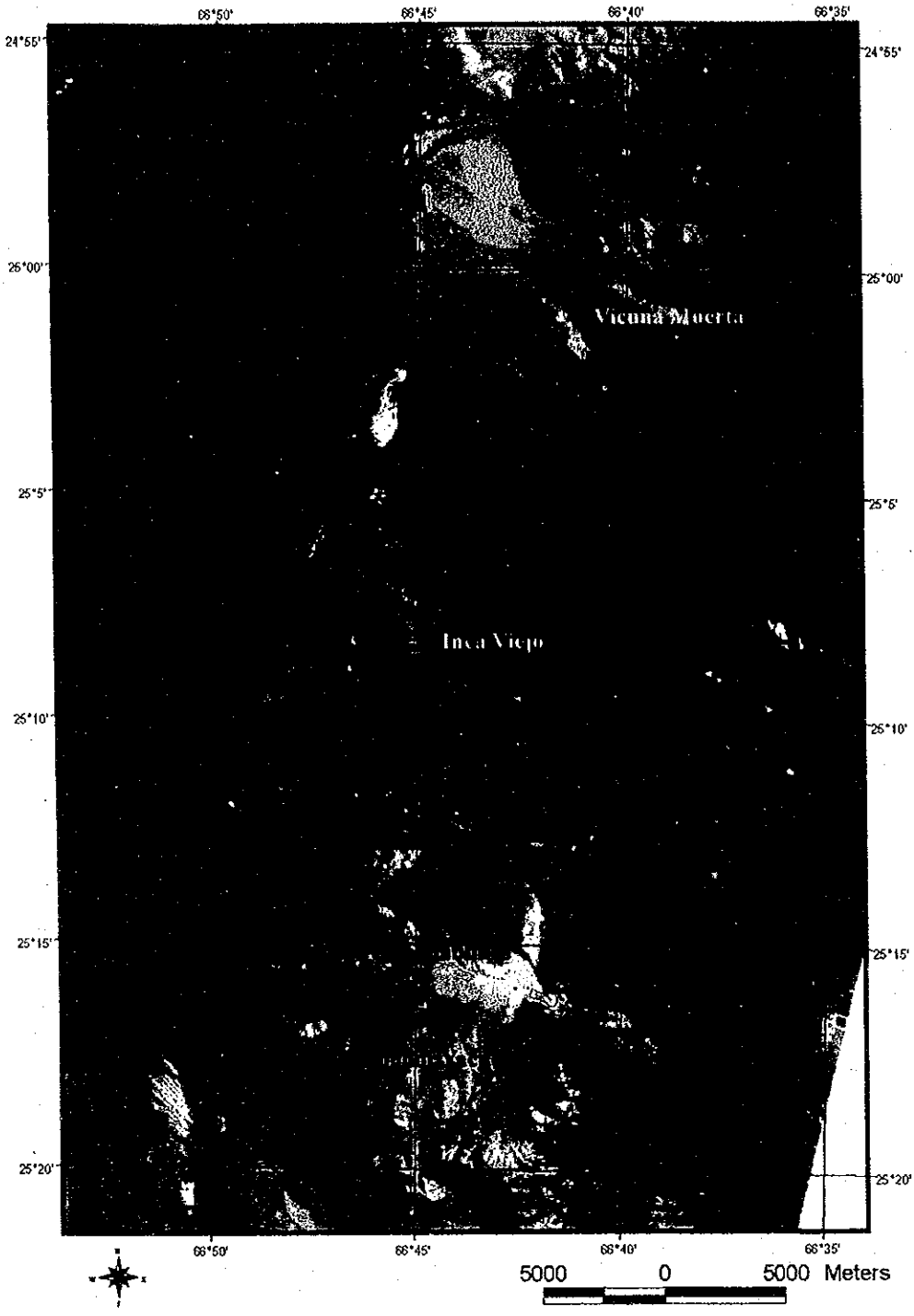


Fig.II-5-2-23-2 Centenario, Inca Viejo, Diablillos, Condor Yacu occurrence (ASTER014)

extracted that was similar to the one obtained in the neighborhood of Diabillos or Centenario mineral showings.

1996: Aranlee Resources Ltd. conducted an exploration but gave up the mining right because it determined that sufficient potentiality cannot be expected.

4) Geology and tectonics

This mineral showings is located on the west side of the large-scale Diabililos-Cerro Galan fault of a north-and-south oriented trend, has Inca Viejo mineral showings, which accompanies a large alteration zone located about 18 km to the south, and also has Diabililos mineral showings about 13 km farther ahead. The geology is made up of a wide distribution of Ordovician (~Silurian) granite and a distribution of Precambrian metamorphic rocks along the Diabililos-Cerro Galan fault. The mineral showings is located ingraben structure between two rows of faults, north and south, respectively. Vicuna Muerta consists of Miocene rhyolitic and dacite intrusive rocks intruding into granite, and also of extrusive rocks; it characteristically shows a clear ring structure of about 6 km in diameter. According to the past survey by SEGEMAR, hydrothermal breccia is distributed along the western edge of the ring structure. In the K-Ar age determination of sanidine in dacite intrusive rock (A01KN101), the age was determined at 18.9±0.5Ma.

5) Mineral showings and alteration

As stated earlier, although copper, lead and zinc anomalies were observed in the exploration of streams and sandy soil, no significant hydrothermal alteration or mineralization was confirmed.

6) Characteristcs of the satellite image

The ring structure is clearly observed on false color images and the NW-SE oriented lineament extends eastward across its center. The false color images show a light green color as if to indicate that the whole ring structure is an alteration zone, while on the iso-grain model images, only three small alteration zones (alteration zone Nos. 206, 207 and 213) are visible with weak Sericite and Chlorite. However, Geothite was detected along the ring structure.

In the field survey, a point located at the western end inside the ring structure and which looked like an alteration zone was checked, but the point assumed to be an alteration zone was found to be a granite block, and muscovite was visually observed in quantities. The analysis of granite samples (A01TK020, A01TK021, A01RT043) confirmed the appearance of Sericite, Kaolinite, etc.

7) Comments

While mineral showings are not evident on the soil surface, airborne geophysical prospecting data (see Chapter 2) suggests the possibility of large-scale intrusive rocks existing in the depths. Hence, it is desired to carry out a geophysical exploration at greater depths and a geochemical exploration for precious metals as well as to make hydrothermal alteration charts.

8) Reference materials.

SEGEMAR (19**) ANOMALIA VICUNA MUERTA

5-2-24 Inca Viejo Mineral showings (Zone 31)

1) Location

At 25°08'45.4" S. Lat., 66°45'48.5" W. Long., 4,426 m above sea level and 150 km southwest of Salta.

2) Access

Access is gained by travelling on the unpaved road to the south from San Antonio de Cobres and by driving a 4-wheel-drive car about 14 km to the east on the unpaved road branching from the south of the Salar Ratonesnono salt lake.

3) Past surveys

1980: Fabricaciones Militares conducted a geological survey and a geochemial exploration.
1997-1999: High American Gold Inc. conducted an exploration, drilled five bore holes as deep as 542.3 m, and discovered porphyry-type copper and gold mineralization in tourmaline breccia.

4) Geology and tectonics

This mineral showings is located somewhat to the north of the junction between the large-scale Diabilillos-Cerro Galan faults having a north-and-south trend and the Cerro Ratones lineament that has a northwestern trend showing rows of Miocene volcanic activities (Fig. II-5-2-25-1). Ordovician (~Silurian) granite is widely distributed in the west side, and Precambrian metamorphic rocks are along the Diabilillos-Cerro Galan faults. The mineral showings is located in the graben structure sandwiched by the two rows of faults, north and south, respectively.

5) Mineral showings and alteration

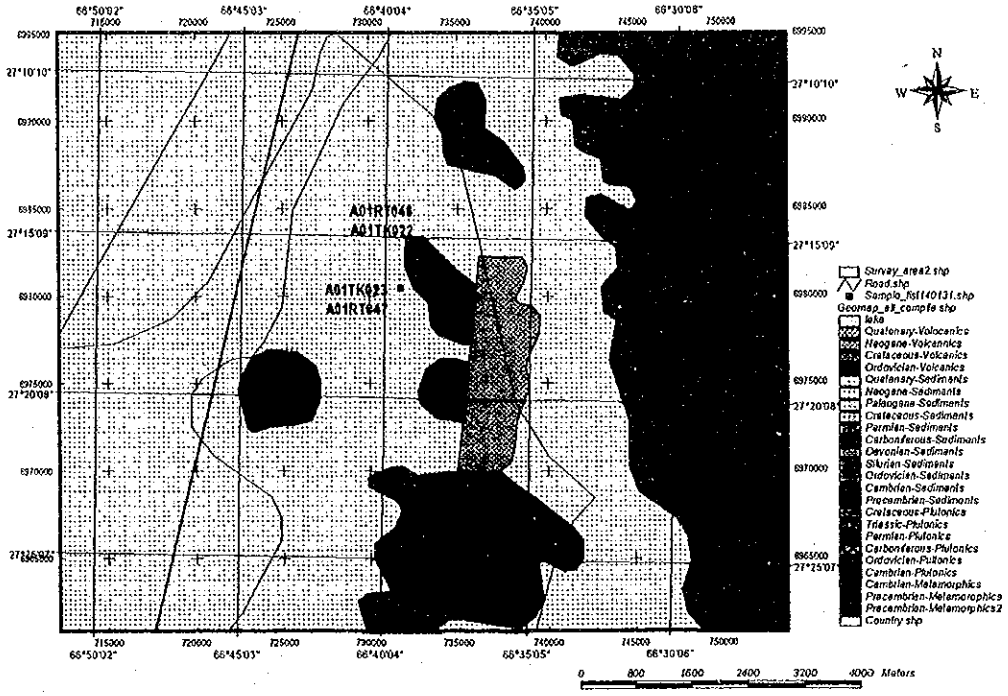
The deposits are porphyry type gold, molybdenum and copper deposits. In addition, lead, zinc and silver anomalies are known. The soil surface seems to have oxidative eluviation with the color varying from red to white and a concentration of Jarosite recognized locally.

The sample analysis of the white alteration porphyry (A01TK022, A01TK023) detected Jarocite and Sericite. While the mineralization accompanies Geothite, Jarocite, Chrysocolla, etc. in such iron oxides as gossan and quartz veins, the copper content in the soil surface seems to be low because of eluviation.

On the homepage of High American Gold Inc. in May 1999, the result of survey in this area (Oesteroche drilling program) was introduced.(http://web.idirect.com/~hag/news/may/2099.html).

It relates that the survey in this area was carried out in two stages, Phase 1 and Phase 2, from

Inca Viejo occurrence



(a)

(b)

(c)

Fig. II-5-2-24-1 Inca Viejo occurrence
(a) sample point, (b) perspective view, (c) silicified rocks

1997 in the manner outlined below:

(Phase 1)

. Sample analysis of soil (489 samples), stream sand (32 samples) and rock (162 samples).

. Making of detailed geological maps (1:500 and 1:13250)

. Landsat image analysis

Consequently, a max. of 111 g/t-Au was detected in the soil samples, and 17.2 g/t-Au in the rock samples.

(Phase 2)

.Construction of exploration roads (2,300 m)

.Sample analysis of soil (74 samples) and rock (215 samples).

In Phase 2, a max. of 2.44 g/t-Au was detected in the soil samples, and 4.18 g/t-Au in the rock samples.

In addition, five bore-holes were drilled into breccia (Phase 1 drilling program; 542.3 m in total length). It detected a max. of 4.76 g/t Au for gold (Hole 99-1; 1 m breccia width), discovered a trend that the gold anomaly increases toward greater depths, and confirmed the two copper enriched layers (Hole 99-2), i.e. 0.84% (5 m wide) at a depth of 63.4 m and 1.74% (3 m wide) at a depth of 81.5 m.

6) Characteritics of the satellite image

The alteration zone is shown in a light green color on ASTER false color images, in a white color on the color-ratio composites, and in a red color oniso-grain modelimage; thus, it is easily distinguishable. The alteration zone is extracted at three places (alteration zone Nos. 198, 199 and 201), both large and small, of which the largest distribution (about 4.3 km in the NNW-SSE direction and about 2.5 km at its right angles) is shown as an alunite-kaolinite alteration that on the geological map, agrees with the distribution of Tertiary volcanic rocks having a smooth surface. Further, distribution of a Scricite zone surrounds it from north to south. This is in agreement with the distribution of Precambrian metamorphic rocks.

7) Comments

This site has long been known as a porphyry-type copper and gold mineral showings; detailed explorations have been carried out to the stage of deposit verification drilling. In the future, commercial explorations are anticipated.

8) Reference materials

5-2-25 Diablillos mineral showings (Zone 31)

1) Location

At 25°18'34.6" S. Lat., 66°47'47.2" W. Long., 4,280 m above sea level and 14 km south of Inca Viejo.

2) Access

Diablillos is accessible by travelling on the unpaved road going south from San Antonio de Cobres and by driving a 4-wheel-drive car from the west side of the mineral showings.

3) Past surveys

1985: SEGMAR conducted a basic survey.

1991: BHP carried out a drilling survey.

1996: Barrick Gold Corp., a partner of Pacific Rim, conducted surveys including drilling (DDH: 24, RC:150), geological, geochemical and geophysical (CSAMT) explorations.

2001: Barrick Gold Corp. transferred its 70% interest to Pacific Rim, and now Pacific Rim owns 100% of the interest.

4) Geology and tectonics

This mineral showings is located close to the south part of the junction between the Diabililos-Cerro Galan faults and the Cerro Ratones lineament. Ordovician (~Silurian) granite is widely distributed and, with the Diabililos-Cerro Galan faults forming a boundary line, Precambrian metamorphic rocks are distributed in the east and Ordovician sedimentary rocks in the west. They are covered by a distribution of Tertiary andesitic volcanic rocks in the west of the mineral showings.

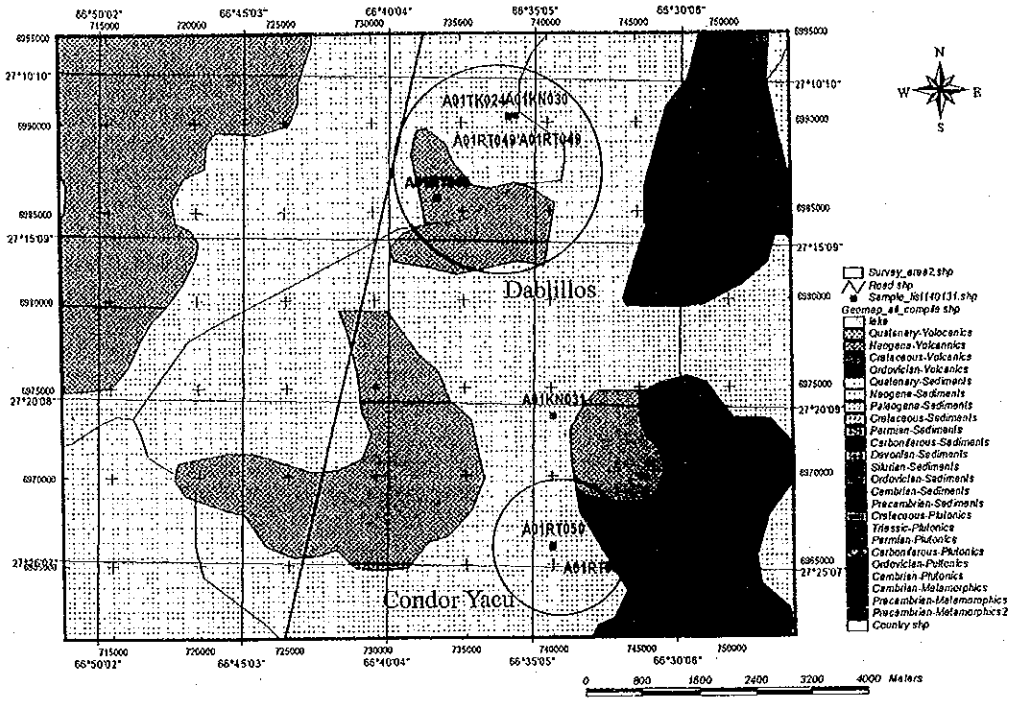
5) Mineral showings and alteration

The deposit is a highly sulfurized epithermal gold and silver deposit with a secondary enrichment zone. The alteration zone is divided into many components distributediso-grain model Blanco (alteration zone No. 189, etc.), Diabulillos Sur (alteration zone No. 186, etc.), Cerro Bayo (alteration zone No. 180, etc.), that are observed in Silurian granite and Precambrian metamorphic rocks. In the present survey, in which samples were taken from Diabulillos Sur, a wide distribution of silicified rocks was seen and alteration containing Jarocite and Sericite/Chlonite was significantly observed (granite: A01TK24; tuff breccia: A01RT049).

6) Characteristics of the satellite image

The alteration zone develops a light green color on ASTER false color image, a white color on the color-ratio composites and a red color oniso-grain model images for clear discrimination, and shows almost the same alteration zone distribution as in the past surveys. Further, the false color images display the granite distribution in a brown to dark brown color, making the surface roughness look rather coarse. The metamorphic rocks also develop a brown color, but their surface roughness

Diablillos occurrence, Condor Yacu occurrence



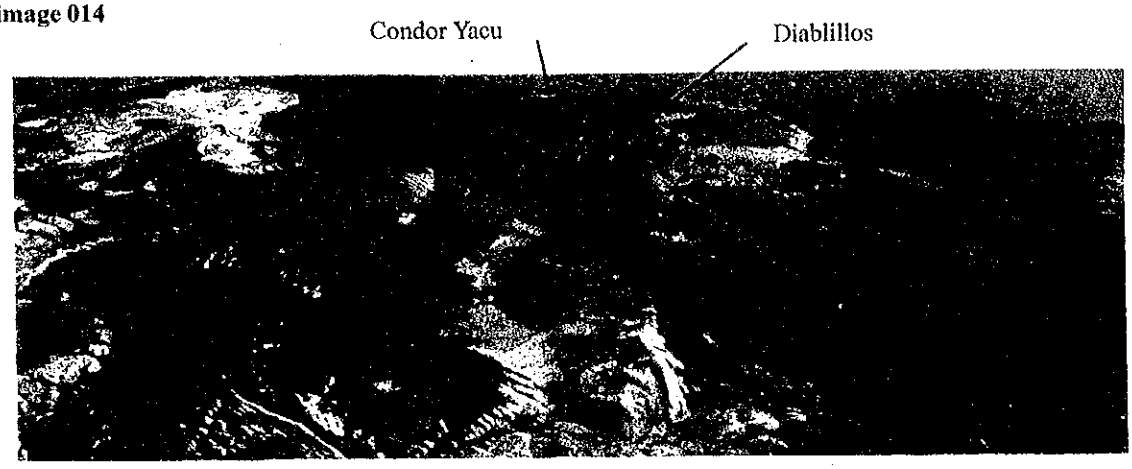
(a)

(b)

(c)

Fig. II-5-2-25-1 Diablillos occurrence and Condor Yacu occurrence
(a) sample point, (b) Diablillos, (c) Condor Yacu

ASTER image 014

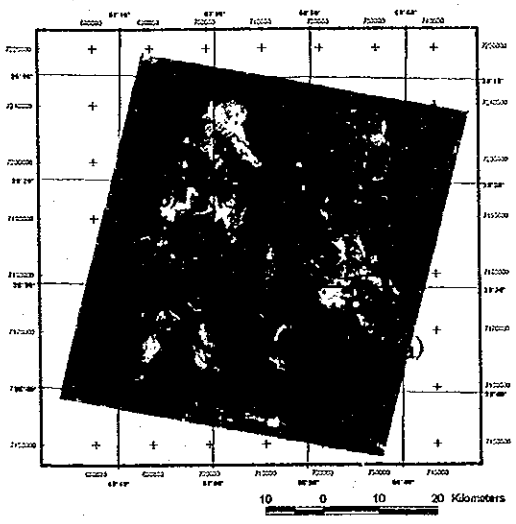


(a)

(b)

Diablillos

Condor Yacu



FigII-5-2-25-2 Birds-eye view of Diablillos occurrence and Condor Yacu occurrence

looks more dense than granite. Also, new volcanic rocks presents smoother surface conditions.

7) Comments

As in the case of Inca Viejo, this place has already progressed to the stage of deposit verification drilling. So, commercial exploration in future is earnestly anticipated.

5-2-26 Condor Yacu mineral showings (Zone 31)

1) Location

At 25°19'35.3" S. Lat., 66°47'47.4" W. Long., 4,290 m above sea level and 3.5 km south-southwest of Diablillos.

2) Access

This place is accessible by driving a 4-wheel-drive car on the unpaved mountain road from Diablillos.

3) Past surveys

2001: Barric Gold Corp. gave up the mining right in June, and Cardero Resource Corp. is now engaged in the exploration. The deposit is divided into two portions, Southern Outcrop and Northern Outcrop. Southern Outcrop is now mainly explored.

According to recent Internet Information of Caldero Resource Corp (http://www.cardero.com/projects.html), five bore holes have been drilled up to now, and 3 ~ 18 g/t of gold, 38 ~ 146 g/t of silver and 0.4 ~ 2 g/t of copper and high-grade gold, silver and copper values are reported.

4) Geology and tectonics

As with Diablillos, this mineral showings is recognized near the junction of the Diablillos-Cerro Galan faults and the Cerro Ratones lineament when viewed in a wide perspective. Actually, it is located 5 km south-southwest of Diablillos. When viewed locally, its location is close to the junction of a fault of the north-northwest trend composing the Diablillos-Cerro Galan faults and a small fault running in the northwest direction. Its wall rock is Silurian granite with Tertiary volcanic rocks and Precambrian metamorphic rocks distributed in the neighborhood.

5) Mineral showings and alteration

The mineralization is said to accompany a deep secondary oxidized zone due to the mineralization of gold and copper brought into granite by highly sulfurized hydrothermal activities in the Miocene along the shear zone near the junction of the Diabilillos-Cerro Galan faults and the Cerro Ratones lineament. (Caldero Resource Corp; http://www.cardero.com/projects.html). The deposit is divided into two, one in Sourthern Outcrop and the other in Northern Outcrop, which is situated 350 m

northwest of the former. The value of Au: 5.96 ~ 48.5 g/t is reported in Southern Outcrop and, though the exploration is not complete yet, a value of Au: 0.28 ~ 2.1 g/t is reported in Northern Outcrop. (http://www.cardero.com/projects.html, January 2002). In the field, silicified granite is distributed over an extensive area, and some concentrations of malachite are observed.

6) Characteristics of the satellite image

The characteristics on the satellite image are essentially same as those of Diablillos, but no alteration zones are extracted in the positions of Condor Yaku. On the false color images, the granite distribution is shown in a brown to dark brown color with the surface roughness looking somewhat coarse.

7) Comments

Cardero Resource Corp is continuing its exploration work, and no subsequent detailed survey will be necessary at the present stage.

8) Reference materials

5-2-27 Brealito mineral showings (Zone 34)

1) Location

At 25°18'35.0" S. Lat., 66°20'55.4" W. Long., 2,557 m above sea level and about 110 km southwest of Salta.

2) Access

This place is accessible by travelling about 24 km from Cachi on National Road 40 along the Calchaqui river to Seclantas, then travelling to the west about 10 km on the unpaved road branching from Seclantas.

3) Past surveys

1975: Fabricaciones Militares conducted geological and geochemical surveys as part of NOA 1 program.

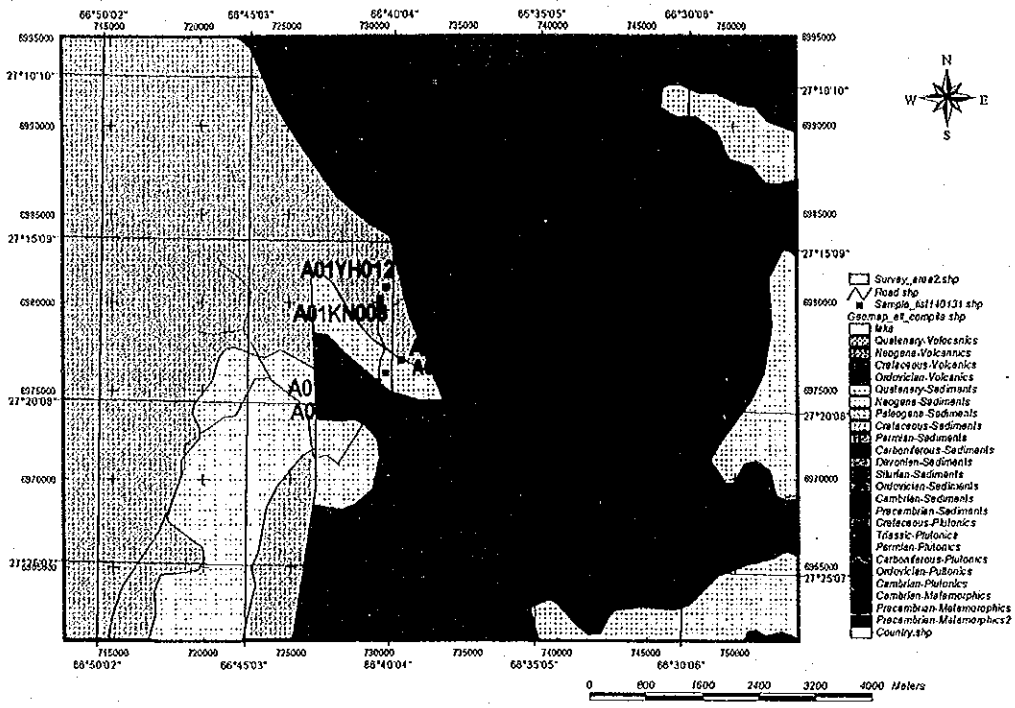
2001: a private company conducted drilling work.

4) Geology and tectonics

Seen in a wide perspective, this mineral showings is located in the "Calchaqui Valley basement," which consists of Precambrian group sedimentary rocks, migmatite and acidic plutonic rocks. The sedimentary rocks show steady folding tectonics under the influence of deformation, though low in metamorphism, existing from the upper Proterozoic to the lower Cambrian.

The plutonic rocks have a compositon from granitic to trondhjemitic and are roughly

Brealito occurrence



(a)

(b)

(c)

Fig. II-5-2-27-1 Brealito occurrence

(a) sample point, (b) perspective view, (c) meta sediments(phyllite) and quartz vein

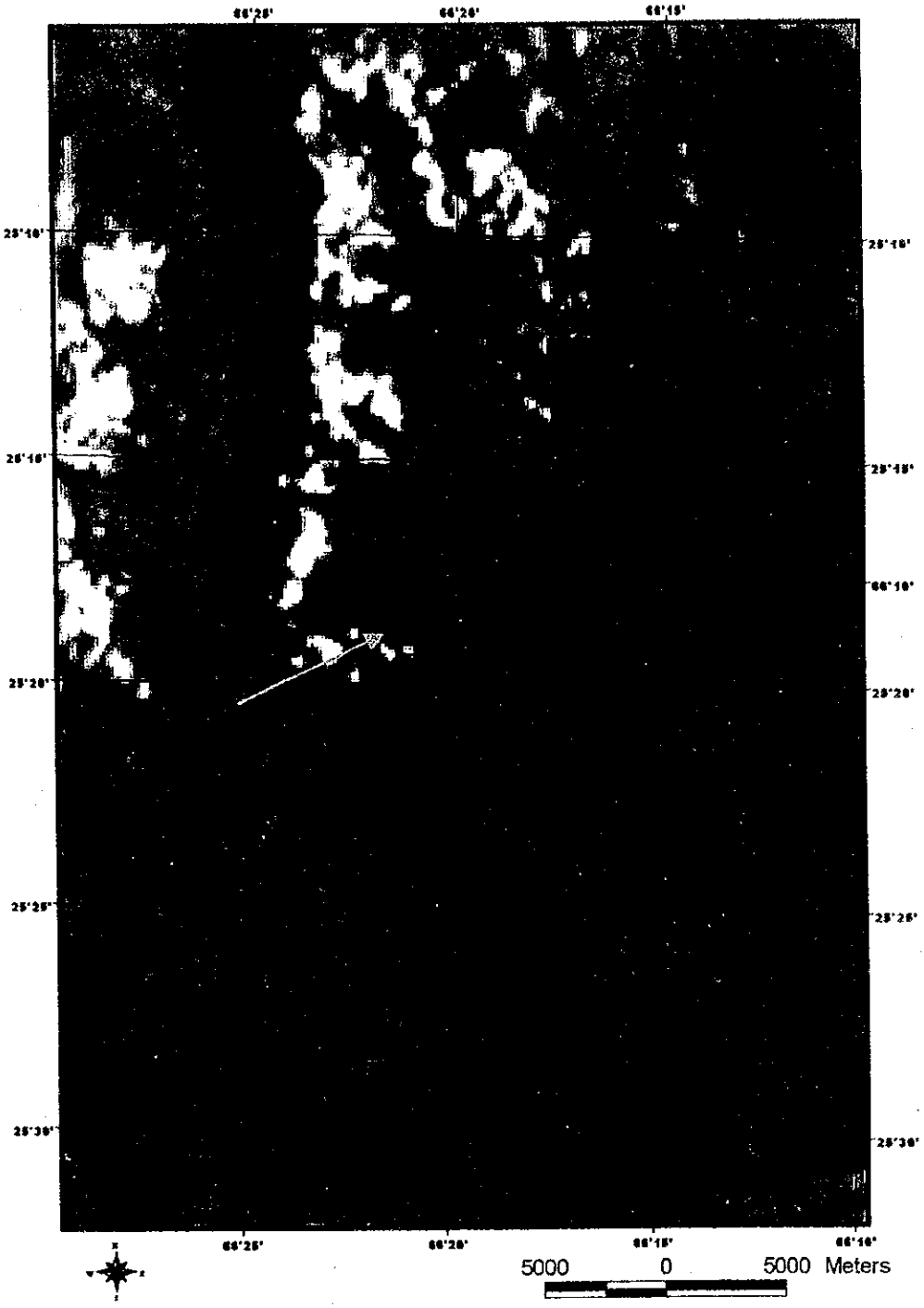


Fig.II-5-2-27-2 Brealito mineral showing (Landsat TM BGR=145)

classified into two types: "Cachi formation" and "Complejo Eruptive Oire." The former comprises trondhjemite, tonalite and granite aged between 460 and 540 Ma. (Hongn et. al, 1999). The latter comprises coarse porphyritic granitoids aged in the Ordovician (Hongn et. al, 1999). This mineral showings was generated by contact metasomatic metamorphism at high temperature and low pressures by the "Complejo Eruptivo Oire" Brealito rocks in Brealito to the west of Seclantas.

5) Mineral showings and alteration

The mineralization is one of copper by contact metasomatism accompanied with the intrusion of Brealito rocks, but the age of mineralization is not definite. The copper mineralization has a NE-SW orientation. Other mineralization includes anomalies of iron, gold, silver, etc. along the seal zone of the Puncoviscana group. In the present survey, only boulders (A01TK012) containing green minerals were obtained for copper. The analysis of the boulders detected 3.24% Cu. Also, in the analysis of quartz veins (A01TK011, A01KN007, A01RT031), gold was below the detectable limit.

6) Characteristics of the satellite image

In this area, only false color images are available, and no alteration zones were detected. For the Puncoviscana group, which constitutes the basement, a stratification structure that clearly shows a NNE-SSW orientation can been seen on the false color images. The "Cachi formation" plutonic rocks are shown in a rather white color. The Brealito rocks show a color similar to that of the Puncoviscana group, but their surface roughness is smoother.

7) Comments

Because information and data of geological tectonics and geochemical exploration to judge the potentiality are not suficiently available, more detailed surveys are considered necessary. However, there seem little expectations in terms of scale.

8) Reference materials

5-2-28 Laguna Grande mineral showings

1) Location

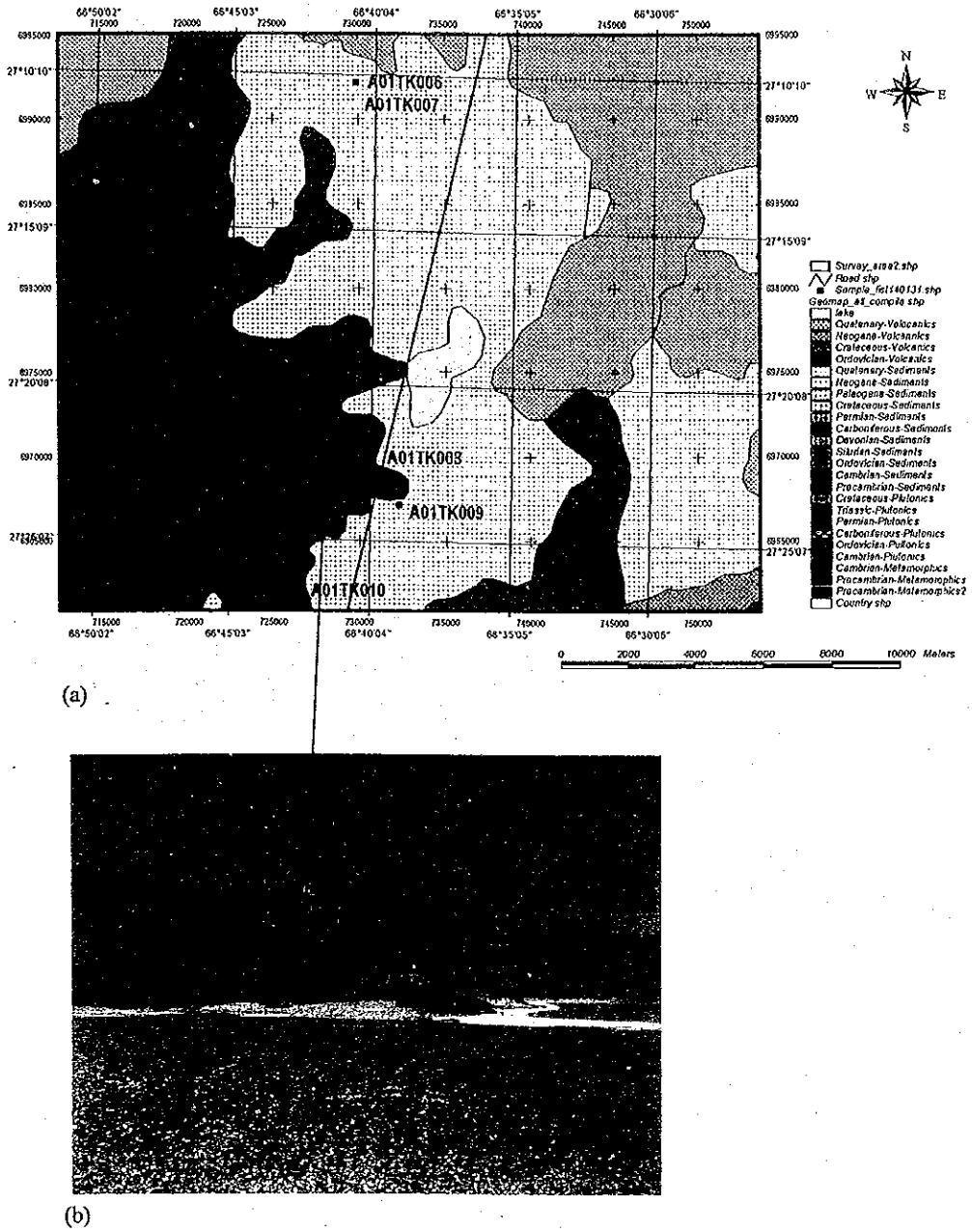
At 26°35'55.0" S. Lat., 66°57'09.7" W. Long., 3,352 m above sea level and about 150 km north of Belen.

2) Access

Access to Laguna Grande is gained by driving a 4-wheel-drive car nearly 30 km through the Pampa extending to the northeast from El Peñon, a town located along National Road 40.

3) Past surveys

Laguna Grande alteration zone



(a)

(b)

Fig. II-5-2-28-1 Laguna Grande alteration zone (perspective view)
(a) sample point, (b) perspective view

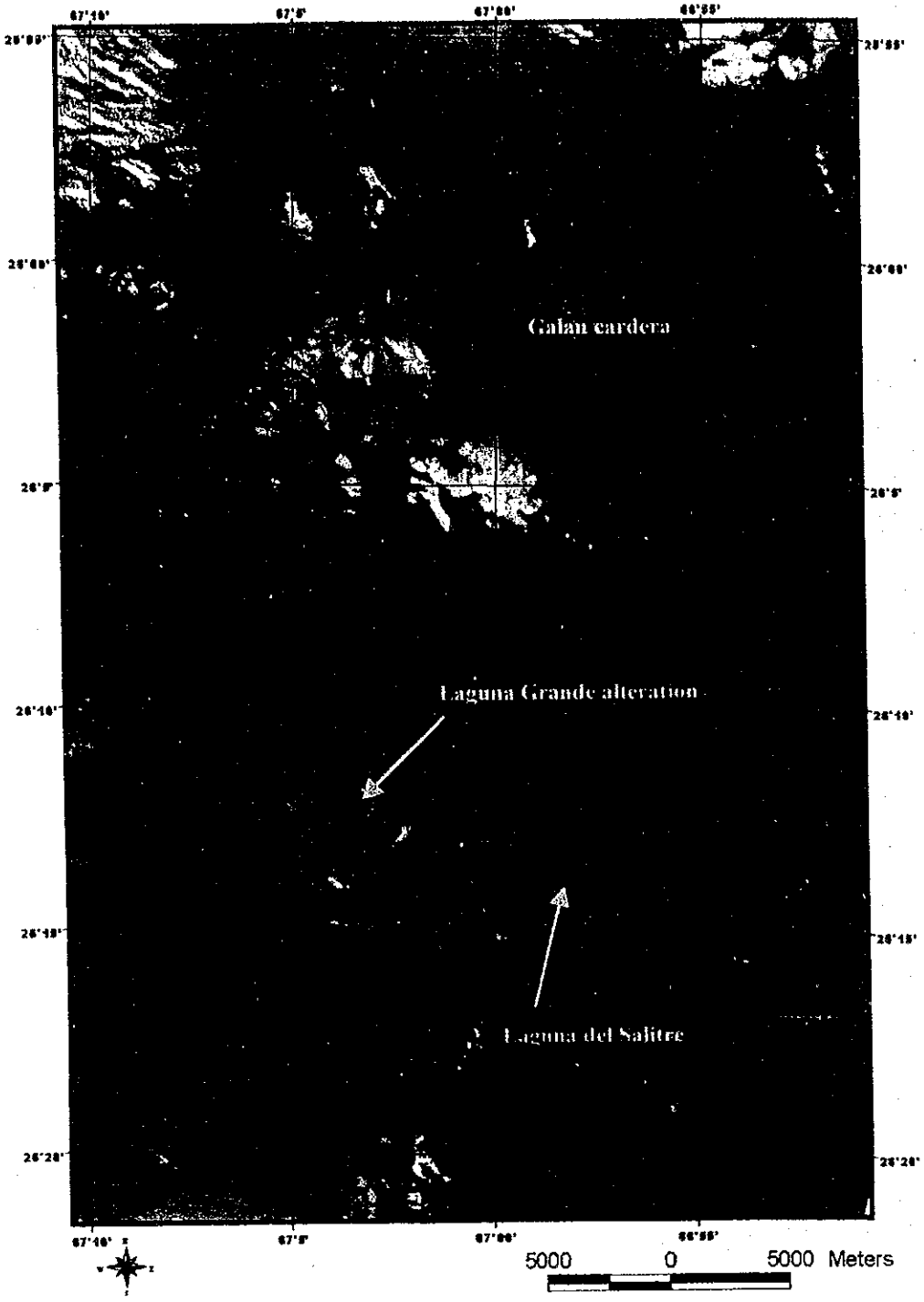
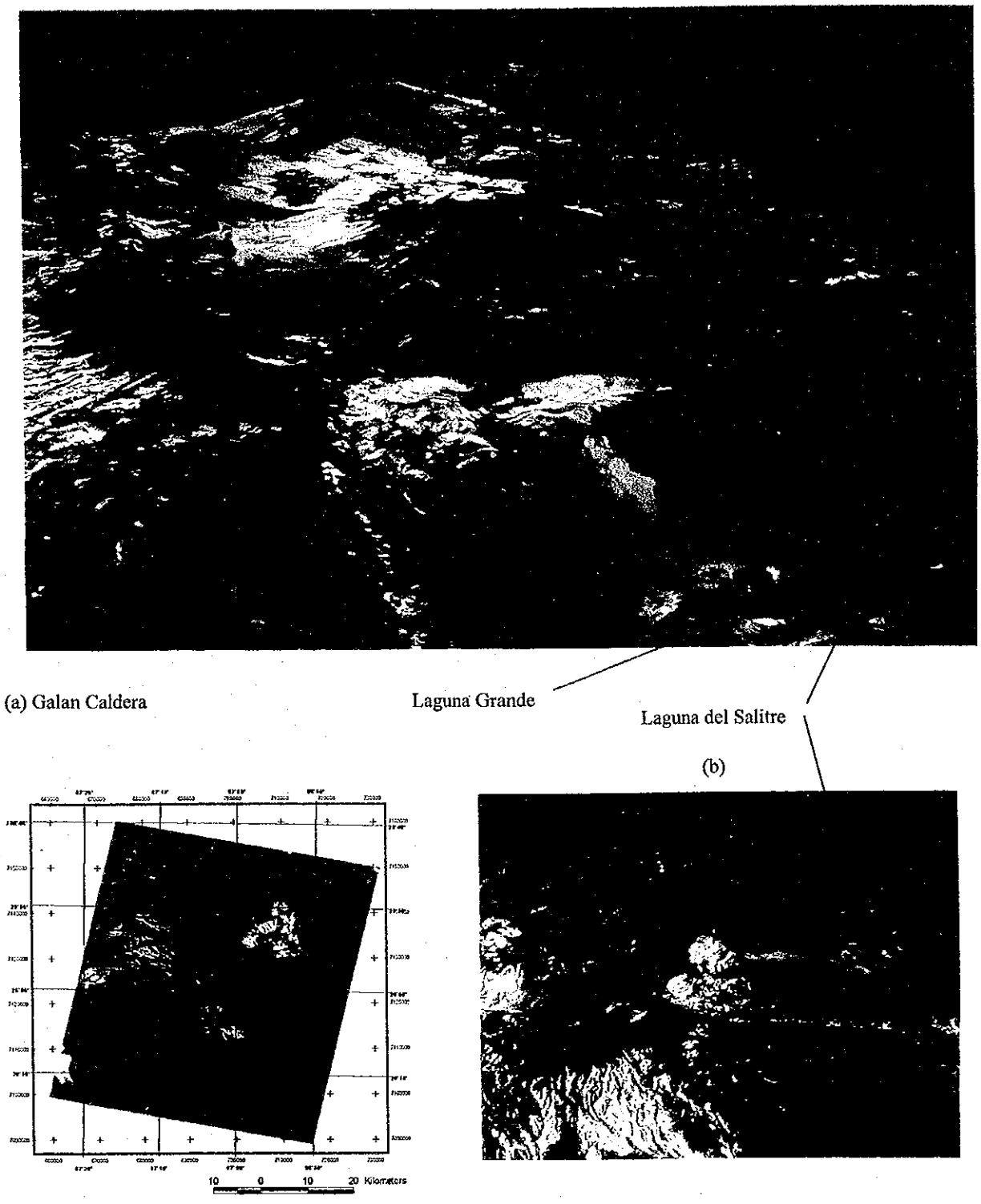


Fig.II-5-2-28-2 Laguna Grande alteration (ASTER015)

ASTER image 015



FigII-5-2-28-3 Birds-eye view of Laguna Grande alteration and Laguna del Salitre occurrence

There are no past surveys.

4) Geology and tectonics

The survey area and its vicinity are made up of the Cambrian metamorphic sedimentary rock basement and Ordovician granite intruding into the basement. In tectonics, fractures in the NE-SW to NNE-SSW orientations are dominant. To the notheast of this alteration zone are the giant Galan Caldera (about 50 km major diameter by about 30 km minor diameter) and an extensive distribution of Tertiary to Quaternary volcanic rocks.

5) Mineral showings and alteration

The areas (alteration zones No. 112, 123, etc.) discriminated by ASTER as alteration zones essentially agree with the granite distribution areas but no mineralization was recognized. The granite is coarse and has reddish brown to white alteration, and some even allow metamorphic sedimentary rocks to admix. As with Laguna Blanca, muscovites can be observed in quantities in coarse granite particles, and the result of sample analysis (A01TK006, A01TK008) also detected Sericite. Probably, ASTER images extracted these as alteration zones.

6) Characteristics of the satellite image

The ASTER false color images show the places seen as alteration zones in a light green color, but such places are not shown clearly on the color-ratio composites. In theiso-grain model images, kaolinite is extracted at the center, around which an extensive sericite alteration zone is detected.

7) Comments

Like Lagna Blanca, this mineral showings was also extracted as an alteration zone on ASTER images, but no clear mineralization was recognized. In the present survey, however, recognition of the field as far into the center of the area was not made, and, hence, it is too early to decide that there is no mineralization. Further, because many areas presumably considered alteration zones are detected by ASTER, it is assumed that there were some brisk hydrothermal activities going on. In the future, it is necessary to increase the number of case studies on such unidentified alteration zones.

8) Reference materials

There are no reference materials.

5-2-29 Laguna del Salitre mineral showings (Zone 39)

1) Location

At 26° 14' 54.7" S. Lat., 66° 52' 48.7" W. Long. and 4,323 m above sea level (at an abandoned pit) This zone is located on the northeast bank of Lagna del Saritre about 55 km

south-southeast of Antofagasta de la Sierra.

2) Access

It is accessible by driving a 4-wheel-drive car from El Peñon along Provincial Road 43 for about three hours. The distance from El Peñon is 46 km.

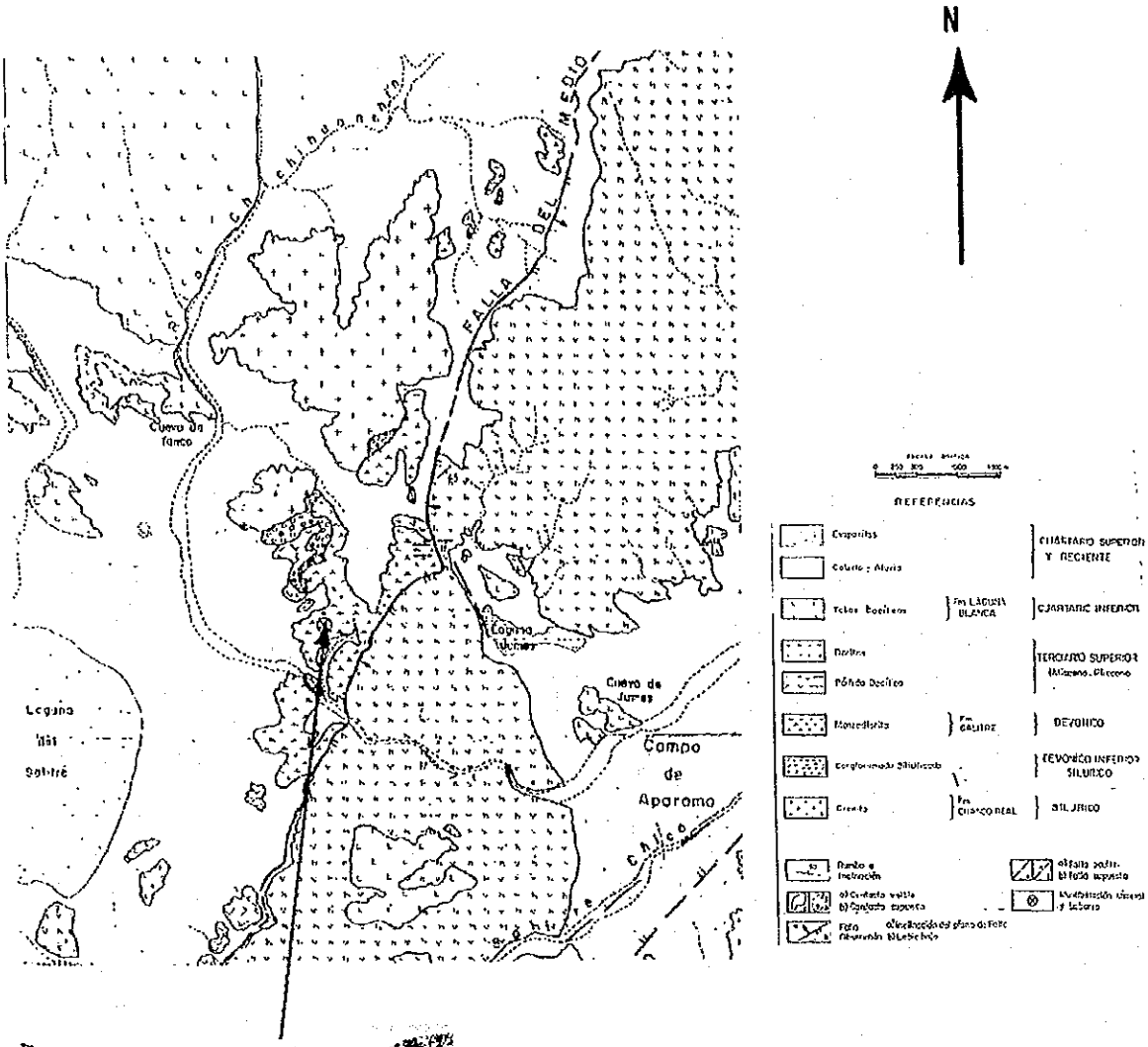
3) Past surveys

4) Geology and tectonics

This mineral showings is located in the southern outside of Cerro Galan Caldera. It is considered that this caldera develops on Precambrian to Paleozoic bedrock that has become a horst-graben. This horst-graben is controlled by faults extending south and north, the distance between which is about 20 km (Sparks et al., 1985). Geology surrounding the mineral showings is comprised of granite (of the Silurian), conglomerate (of the lower Silurian to Devonian) and monzonitic granodiorite (of the Devonian), all of which comprise the basement, dacite (of the Miocene to Pliocene) which is eruption of Cerro Galan Volcano and covers the foregoing ones, and ignimbrite outside Cerro Galan Caldera (Gonzares, 1981) (Fig. II-5-2-28-1). The basement rocks and tertiary volcanic rocks are separated by the "Falla del Medio" fault with an eastward dip. However, as there was a possibility that the epoch of monzonitic granodiorite and conglomerate both of which are the basement is the Pliocene, the K-Ar age determination was carried out with the whole rock of monzonitic granodiorite (A01KN002). The value of 29.1+/-0.7Ma was obtained as a result, and then this rock was proven to be regarded as intrusive rock of the Tertiary. It is shown under a microscope that this monzonitic granodiorite is equigranular and holocrystaline and is composed of automorphic plagioclase and a small amount of opaque minerals. Alteration is feeble and the slight presence of chlorite is found. The result of chemical analysis of the whole rock shows characteristics of the island-arc type (Fig. II-5-4-1).

5) Mineral showings and alteration

There is a disused pit and a remaining slag pile (approximately 10 m x 7 m) (Fig. II-5-2-28-1). Veins assumed from remaining slag are galena, zincblende, azurite, and chrysocolla quartz veins, which have monzonitic granodiorite as wall rock. A quartz vein observed at the disused pit has a width of several centimeters and presents the direction of N20W. Vein-edge alteration is rarely found. dacitic porphyry in the vicinity has not been altered. The result of a microscopic examination shows that remaining slag of quartz veins (A01RT020) comprises jasper-like quartz, hematite and limonite, but no gold/silver minerals were observed. The following values were obtained from grade analysis of another ore sample (A01RT019): Au of 0.5 g/t, Ag of 142 g/t, Cu of 0.21 g/t, Pb of 6.03% and Zn of 3.18%. As the age of monzonitic granodiorite, wall rock, is 17 Ma, it is judged that mineralization occurred in relation to Cerro Galan volcanic activities.



Oxide copper, spharelite bearing quartz vein

Fig.II-5-2-29-1 Laguna Salitre mineral occurrence

6) Characteristics of the satellite image

A linear border in the direction of NNE to SSW (Falla del Medio), with dacite distributed on the southeast side, is observed. No other characteristics to be specially mentioned are found.

7) Comments

This mineral showings has mineralization related to volcanic activities of the Tertiary, but this mineralization is local because the alteration is weak. However, it is expected that, around Cerro Galan Volcano, there are epithermal deposits accompanying the hydrothermal system, which are formed by volcanic activities of this volcano. Therefore, for those that exist near the caldera wall (for example, 015-1 and 015-5) among alteration zones extracted by satellite image analysis, it is desired to examine their characteristics and the presence or absence of mineralization.

(8) Reference materials

5-2-30 Laguna Blanca mineral showings

1) Location

At 26°35'55.0" S. Lat., 66°57'09.7" W. Long., 3,352 m above sea level and about 110 km north of Belen.

2) Access

Access is gained by travelling northward on National Road 43, which branches northwestward from National Road 40 at a point about 40 km to the northeast of Belen. The road is unpaved but relatively level and provides easy access.

3) Past surveys

There are no past surveys.

4) Geology and tectonics

This area and its vicinity are distributed with Ordovician granite, Tertiary volcanic rocks and Cambrian metamorphic rocks. The present survey area (alteration zone No. 84) is the area of granite distribution on the northwestern coast of the Laguna Blanca salt lake. In this area, NW-SE oriented faults are dominant. Although this area shows no faults on its geology map, NW-oriented faults are shown on the coast opposite to Laguna Blanca, and this survey area is considered as an extension of those faults.

5) Mineral showings and alteration

While no particularly remarkable mineralization is observed here, the site comprises coarse

Lagna Blanca alteration zone

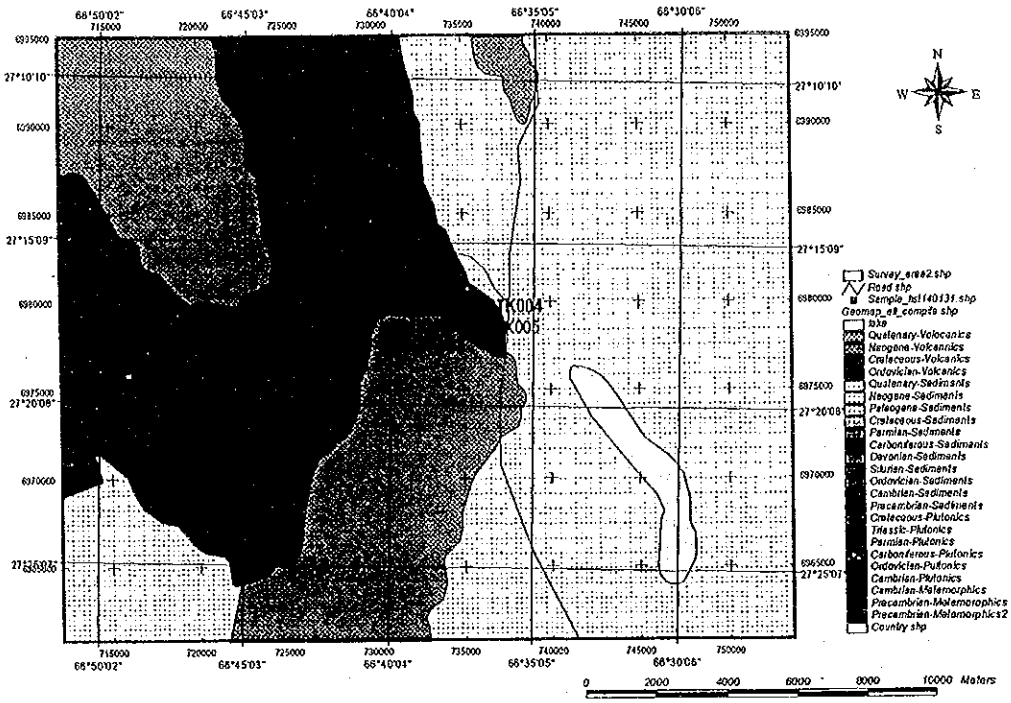


Fig. II-5-2-30-1 Lagna Blanca alteration zone
(a) sample point, (b) perspective view

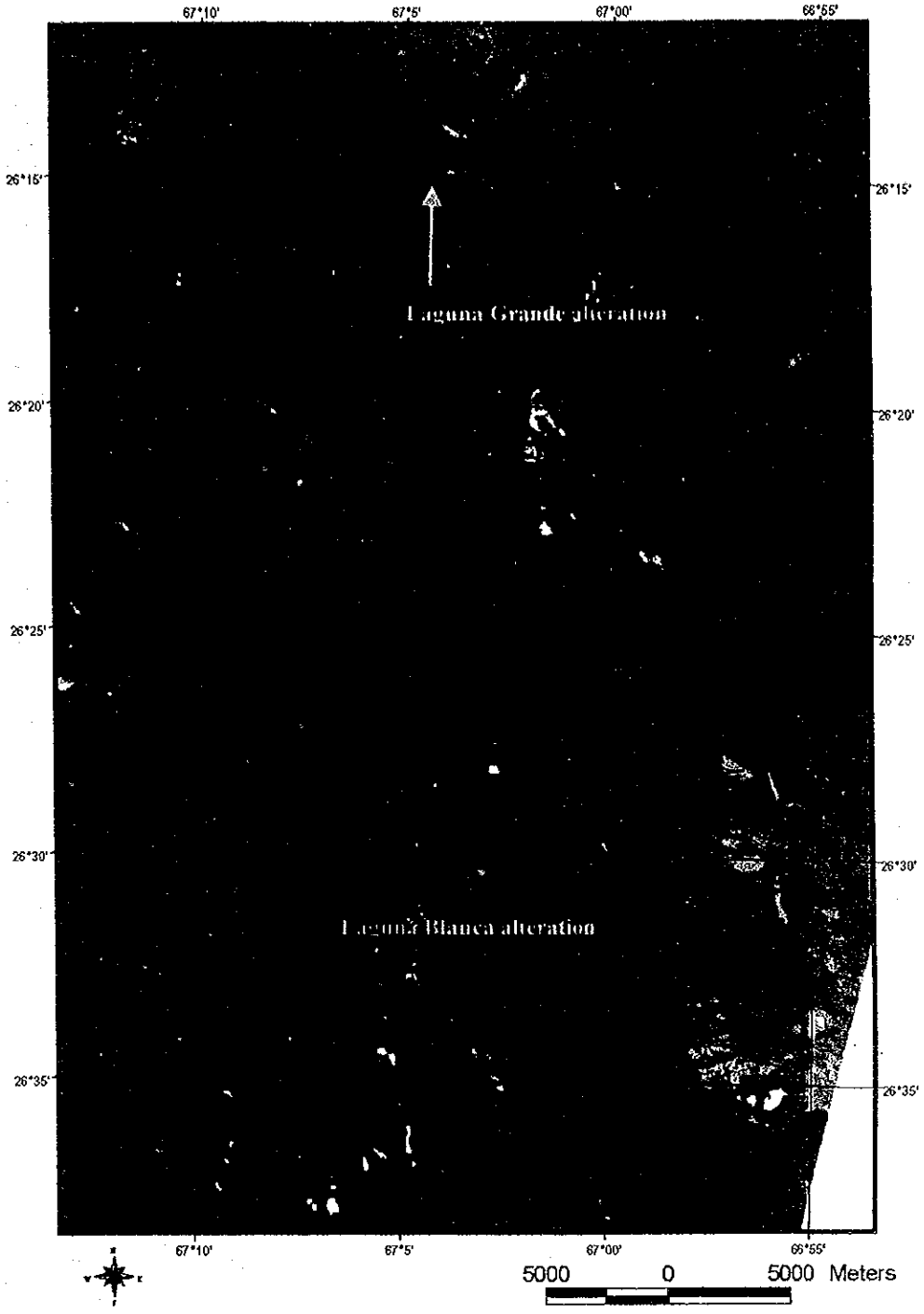
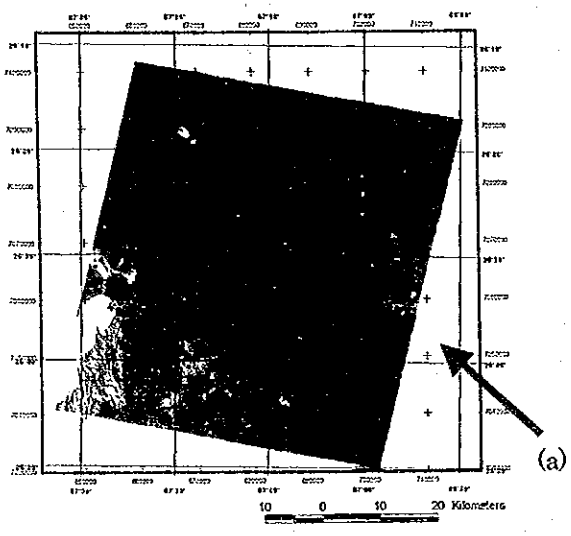


Fig.II-5-2-30-2 Laguna Blanca alteration (ASTER016)

ASTER image 016

(a)

Laguna Blanca alteration



FigII-5-2-30-3 Birds-eye view of Laguna Blanca alteration