The alteration zone of CM010 was confirmed by the field survey.

9) Laboratory work results

It was shown by powdery X-ray diffraction that no alteration minerals were identified for the samples of A00MZ004 and A00RM005 and that these samples are fresh. Meanwhile, concerning alteration zone of CM010, sericite was identified for sample of A00HH004, and sericite and kaolin were identified for sample of A00RM007 (Appendix 5).

In the chemical analysis, the samples of A00HH004 and A00MZ004 to 006 showed no noticeable results.

10) Assessment

No noticeable hydrothermal alterations nor geochemical anomalies were observed in the Butalón Norte where exploration was conducted in the past. Further, although the alteration zone of CM010 in the south is affected by sericite and kaolin alteration, no geochemical anomalies were obtained there. These resluts lead to consideration that the possibility of mineralization in this district is low.

3-2-3 Andacollo district

1) Location

This district is located in the northwestern part of Neuquen province (Fig. II-3-1) with a representative town of Andacollo. Sofia and Erica deposits known as the Andacollo mine are located. The area is lat. 37° 06' 00" to 37° 16' 12" S, and long. 70° 34' 48" to 70° 42' 36" W (Fig. II-3-2-3a), and about 270 km^2. The representative coordinate is lat. 37° 11' 30.1" S and long. 70° 37' 58.5" W at the adit entrance of Level-1 in Sofia deposits.

2) Topography and vegetation

This district is located on the western foot of the Cordillera Vient ranging north to south and at the junction where Rio Neuquen flowing southward meets Rio Reñeleuvú and turns eastward. The elevation is approximately between 1,000 m and 3,000 m above sea level. Although each mountain is prefixed with the Cerro, meaning "hill," the mountains are significantly different in relative height in topography. The vegetation is sparse with short grasses only. Though, in some places, pine trees are planted.

3) Access

It is 160km drive on No. 40 national road to north from Zapala city to Chos Malal town. The road is paved. From the Chos Mala town, it is 33km and about 1 hour drive to northwest

to Andacollo town, nearly one-half of the road is unpaved, and it traverses the Cordillera Viento. Further from Andacollo town, in addition to unpaved roads for mining activities, unpaved trunk roads are present which run to the Chilean border and Varvaro district in north.

4) Previous surveys

In 1890, alluvial gold was discovered in Rio Milla Michico and, in 1894, gold veins were discovered in Cerro Minas. Cerro Minas is the name of a place near the Sofia deposits now under exploitation. In the Plan Cordillerano of regional survey from 1963 to 1969, and in the Plan Cordillerano Centro of drilling survey from 1968 to 1969 conducted by DGFM, gold and copper mineralization was reported for the area of Los Maitenes-El Salvajez. Between 1978 and 1988, CORMINE S.E.P., the public mining corporation of Neuquen province, concentrated its exploration works on the Erica and Sofia deposits. From 1989 to 1991, UTE Aguilar-Kantek conducted a drilling survey of 66 holes totaling 4,482.5 m for the Erica and Sofia deposits. Later, exploration works were conducted by Placer Dome from 1993 to 1995, by Cameco Argentina S.A from 1996 to 1998 and by Minera Andes S.A. from 1997 to 1998.

CORMINE S.E.P., the property owner, signed in 1998 a development contract with Minera Andacollo Gold S.A. of Chilean and Canadian joint venture for the Andacollo project of which exploration has been already conducted. The company imported used ore dressing plant from Canada and started operation at a minimum processing capacity of 200 t/d from January 1999. There are 150 workers employed in total. According to the company sources, the production of gold by cyanide process is 50,000 oz/y and is planned to increase to 80,000 oz/y.

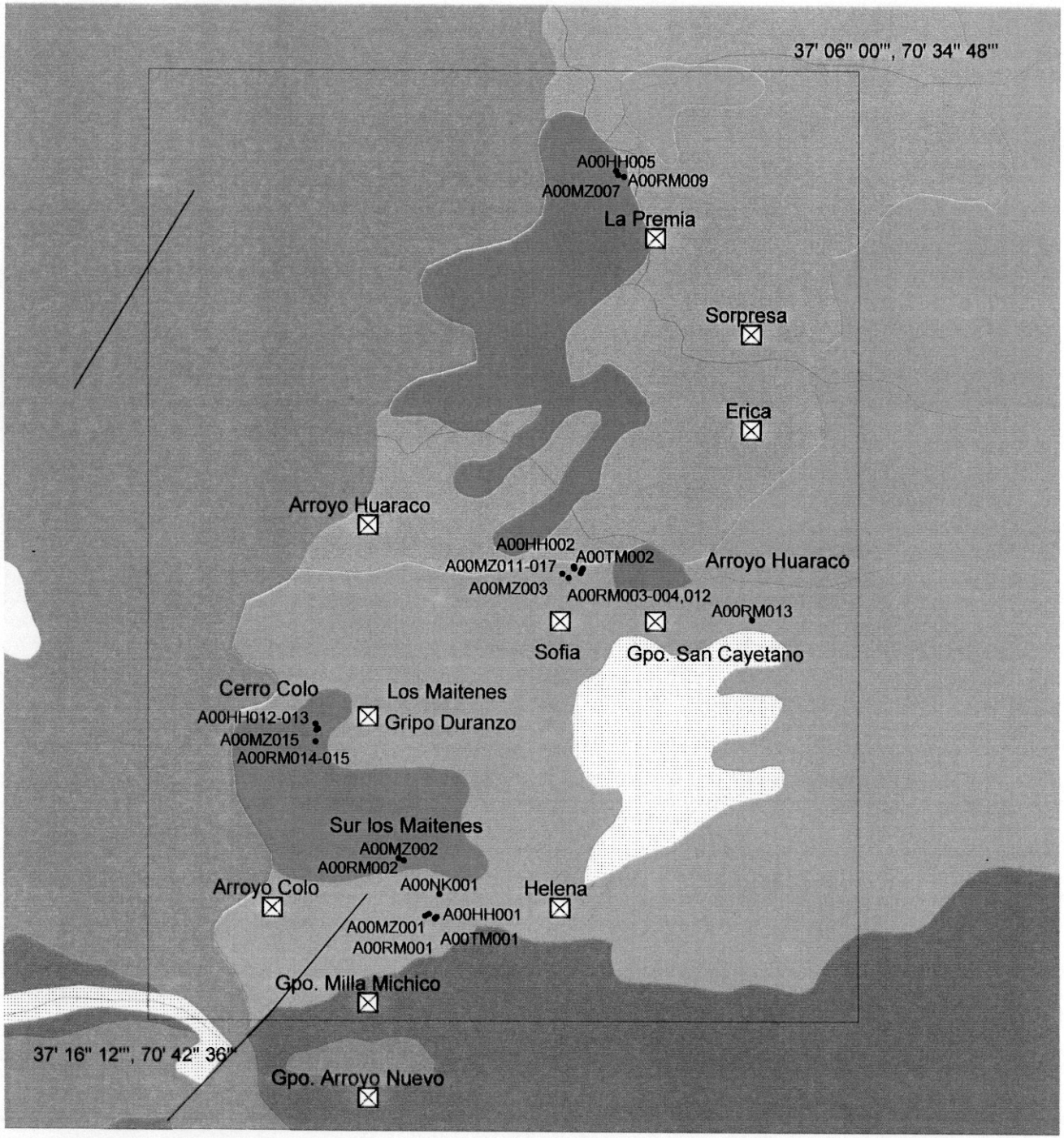
5) Mining properties

CORMINE S.E.P., the public mining corporation of Neuquen province owns the mining property, and the exploitation by the Mineral Andecollo Gold S.A. through the development contract with CORMINE S.E.P. is valid for 20 years and renewable for every 10 years. The area covered by the property is 22,300 ha.

6) Geology and geological structure

The Geology of this district consists of, in ascending order, Carboniferous sedimentary rocks, Permian granitic rocks, Permian to Triassic volcanic rocks, Jurassic sedimentary rocks, Paleogene volcanic rocks and Quaternary glacial sediments, colluvium and alluvium (Fig. II-3-2-3a).

The Andacollo group of Carboniferous is classified, in ascending order, into the Lower tuff, the Huaraco formation of sandstone and mudstone, and the Upper tuff. Geological structure



Known deposit
Sampling point
Lineament
Circular structure
River
Lake

Legend

Quaternary sediments
Pliocene to Pleistocene basalt
Tertiary sedimentary rocks
Tertiary volcanic rocks
Tertiary granitoids
Jurassic to Cretaceous sedimentary rocks
Jurassic to Cretaceous volcanic rocks
Jurassic to Cretaceous granitoids
Permian to Triassic igneous rocks
Carboniferous sedimentary rocks
Proterozoic metamorphic rocks
Alteration zone

Fig. II-3-2-3a Geologocal map with sampling points of the Andacollo district.

is complicated due to folding and faults.

Permian batholith comprises granodiorite, granite and tonalite intruded in the Andacollo group. Choiyoi group of the Permian to the Triassic is distributed overlying them unconformably. Choiyoi group with basal conglomerate at the bottom comprises of basaltic, andecitic and rhyolitic volcanic rocks. The group forms a ridge the Cordillera Viento with its anticline axis in the N-S direction.

The Cuyo group of Jurassic is black mudstone etc., and unconformably overlies Choiyoi group in the southwest part of this district. Sedimentary rocks of the Cuyo group strike ENE-WSW and dip SE.

The Paleogene terrestrial andesite rocks called Serie Andesita. These are distributed mainly in the western part of this area from the Rio Neuquen. These unconformabaly overlie the Andacollo group and Choiyoi group.

The Quaternary comprises glacial sediments of the Pleistocene, and colluvium and alluvium of the Holocene. These are distributed in lowlands along rivers and depressions among mountains.

Dykes and small-sized stocks of dacite, dacite porphyry, andesite porphyry etc. intruded into older than the Jurassic. As there is no Cretaceous igneous activity in and on the periphery of this district, these intrusives are assumed to be Tertiary igneous activity. Dominant intrusions of dykes are in the NE direction.

On the other hand, dominant faults are in the direction of E-W to NE, while faults in the NW direction exist locally. The dip is almost vertical. It is assumed that extension fracture of E-W direction and shear fractures of NE and NW directions were formed by compression stress in the E-W direction.

7) Mineralization and alteration

The Known deposits, alteration zones and sampling points are shown in Fig. II-3-2-3a. Andacollo mine in this district consists of about 50 veins system. The main veins are the Sofia and Erica deposits. The distribution of veins of the Sofia deposits is shown in Fig. II-3-2-3b. The ore deposits are quartz veins with a small amount of sulfides consisting of pyrite, sphalerite, galena, etc. 60 percent of gold is in sulfides, and 40% of gold is in quartz. The veins strike E-W and N40° to 60° E and vertical. The strike extension of the longest vein which has transferred due to faults is about 2,000 m, and vertical extension of the vein reaches 1,000 m. The vein width ranges from 0.5 to 1 m. Sofia deposits area hosted in black mudstone of Huaraco formation with dacite dyke along the veins. Sericite was identified by the POSAM measurement for sample of A00MZ003 that is argillized dacite dyke.

From the satellite image analysis, hydrothermal alteration zones were extracted in the area to the south of the Los Maitenes deposit. Cameco Argentina S. A. conducted the

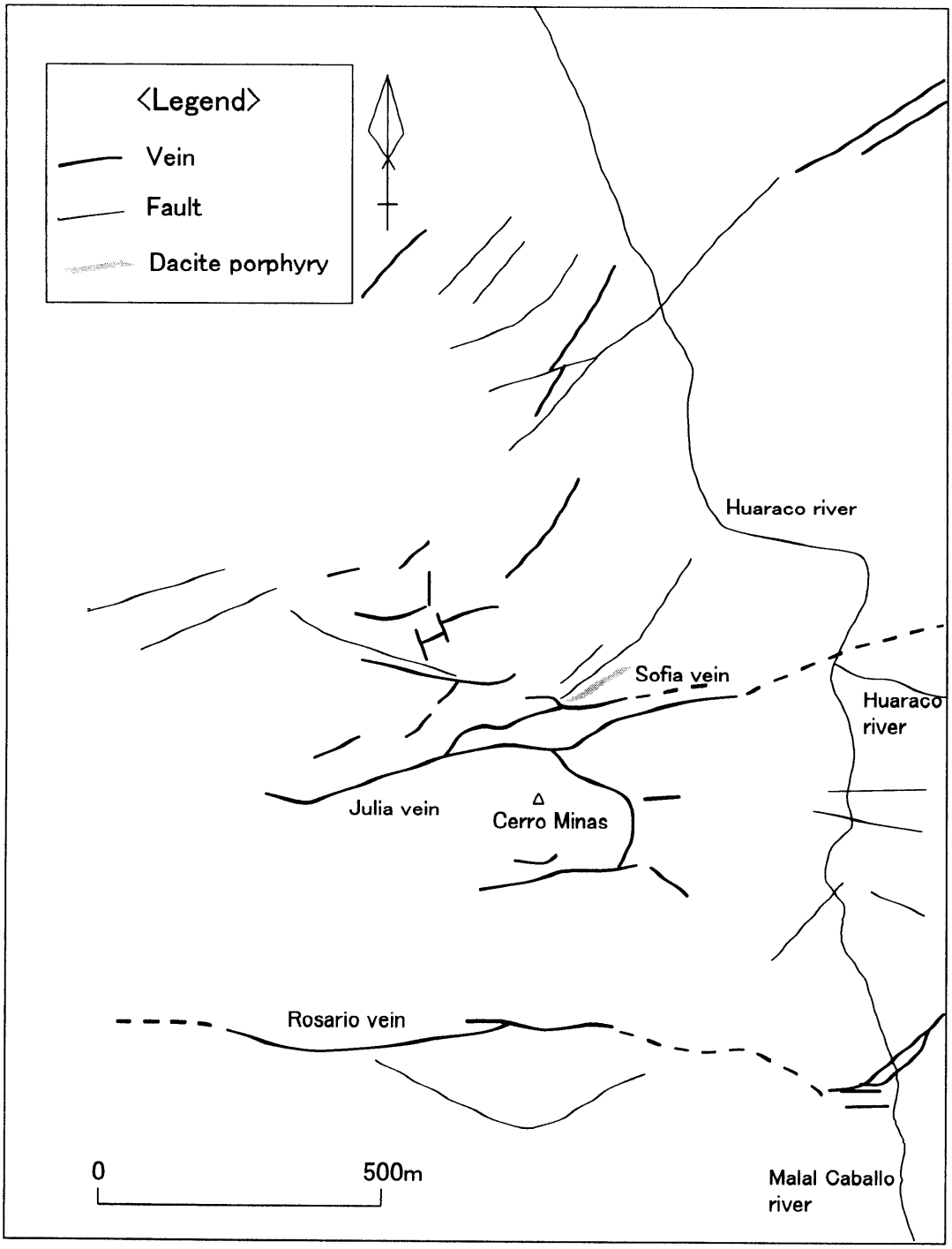


Fig. II-3-2-3b Veins of Sofia ore deposits of the Andacollo gold mine, after CORMINE (1998).

exploration in the area of sampling points of A00MZ001, etc. and finally withdrew. Silicified alteration develops in the area where volcanic rocks of Choiyoi group were distributed. Accompanying quartz veins strike N 60° E. Sericite (e.g., sample A00MZ01) and kaolinite (the A00RM002) were identified by POSAM measurement for silicified rocks. In the area where the samples such as A00MZ015 were taken, intrusive rocks were observed but the presence of hydrothermal alteration was not confirmed. The sample A00MZ015 is tonalite looking fresh, and was observed to be accompanied by a small amount of disseminated pyrite and malachite.

Near La Premia deposit, hydrothermal alteration zone was extracted from the satellite image analysis. At the sampling point of A00MZ007, etc., it was confirmed that light gray silicified rocks were distributed and accompanied by veinlets and disseminated pyrite. Sericite was also identified by the POSAM measurement (e.g., sample A00MZ007).

Permian granodiorite looking fresh was observed to be accompanied by disseminated and film like pyrite as well as quartz veins of about 2 cm in width (sample A00RM013).

8) Characteristics of the satellite images

The color tone of the false color image gradually changes from yellowish brown to green. The color tone of yellowish brown means that vegetation is thin. Only the high altitude parts of the Crordillera Viento show blue color due to snow. The structure due to topographical undulations is fine, and water systems are arborescent and dense. Ridgelines are clear to unclear, and differ in resistance. No bedding planes were recognized. NE trending lineaments were extracted. Three hydrothermal alteration zones showing bright reddish purple color were recognized on the ratio image.

9) Laboratory work results

The results of the ore grade assay of veins of Sofia deposits in Andacollo mine are shown in Appendix-9. The sample A00MZ012 was taken in Level-1 (1,408 m above the sea), and A00MZ016 was taken in Level-4 (1,275 m above the sea). Sample A00HH002 is exploited ore from Level-4. These are quartz veins accompanying a small amount of calcite and disseminated pyrite and galena. The gold grade of sample A00MZ012 is 152.85 g/t, and those of A00HH002 and A00MZ016 are 1.71 g/t and 5.49 g/t, respectively. Silver grades of these three samples range from 14 to 91 g/t, copper grades are 150 to 1,660 ppm, lead grades are 0.7% to 2.18%, zinc grades are 1,900 to 9,120 ppm and iron grades are 6.95% to 13.4%. From these results, it is confirmed that high-grade gold ore exists and the main accompaniments are lead and iron.

Concerning the fluid inclusions in quartz of samples A00MZ012, A00MZ016 and A00MZ017, the average of homogenization temperatures are 214℃to 309 ℃, and the

salinities are 3.6 to 4.7 wt%. (Appendix-10). The oxygen isotopic composition of quartz of A00MZ012 is +11.2% (Appendix-12). Then +0.4% is calculated for oxygen isotopic composition of water that precipitated the quartz based on the isotopic fractionation factor between water and quartz (Matsuhisa et al., 1979) at 214℃, the average homogenization temperature. The oxygen isotopic composition of magmatic water is as heavy as +6‰ to +9‰ (Taylor, 1974). That of meteoric water is generally as low as -4‰ to -14‰ (Craig, 196), although it is different according to regions. Therefore, calculated +0.4‰ for water, indicates that the hydrothemal water was the mixture of magmatic and meteoric water.

Sulfur isotopic composition of +3.5‰ was obtained for pyrite in quartz vein of sample A00MZ012. Meanwhile, -14.9‰ was obtained for pyrite disseminated in black mudstone (sample A00MZ014), the host rock of Sofia deposits (Appendix-11). The standard of the sulfur isotope composition is Canyon Diablo Troilite (CDT). Therefore, it is known that the sulfur isotopic compositions of igneous rocks are relatively close to 0‰ of the standard and show a narrow variation range. Sasaki and Ishihara (1979) clarified that Japanese granite of the magnetite series range from 0 to +9‰. On the other hand, it is known that the sulfur isotopic compositions in sedimentary rocks show a wide variation range due to the isotopic fractionation effect by bacteria. Therefore, obtained +3.5‰ of pyrite in the quartz vein indicates that sulfur originated in igneous rocks, while -14.9‰ of pyrite disseminated in black mudstone means that sulfur originated in sedimentary rocks. In addition, the measurement result of the former indicates that the mineralization is related to magma activity.

Petrochemical examination was carried out on granitic rocks. Samples are quartz porphyry (A00MZ011) and dacite porphyry (A00MZ013) in Sofia deposits, andesite porphyry (A00HH012) and tonalite (A00MZ015) in Cerro Colo, and granite (A00RM013) in Arroyo Huaraco. The sample in Arroyo Huaraco is Permian granite. Although ages of other samples are unknown, there is a possibility that they are Tertiary granitic rocks. As shown in the AFM diagram (Fig. II-3-2-3c), all five samples are calc-alkaline granite. In the normative Qz-Or-Pl diagram (Fig. II-3-2-3d), Permian granite in Arroyo Huarraco is plotted in the area of monzogranite. The samples of Sofia deposits and Cerro Colo are plotted in the areas of granodiorite and quartz monzodiorite. In the Rb-(Y+Nb) diagram of Pearce et al. (1984), all five samples are plotted in the area of volcanic arc granites (Fig. II-3-2-3e). Fig. II-3-2-3f shows the chondrite normalized patterns by the chondritic values of Boynton (1984). Elements from La to Lu of lanthanoid are arranged on the transversal axis from the left in the order of atomic numbers, and Y showing the behavior similar to lanthanoid is placed at the right end. La to Sm are classified as light rare earth elements (LREE) and Gd to Lu as heavy rare earth elements (HREE). All of the five samples show the rightward lowering pattern where normalized values decrease toward heavy rare earth elements from light rare earth. Permian granite in Arroyo Huaraco, however, has more rare earth elements than other

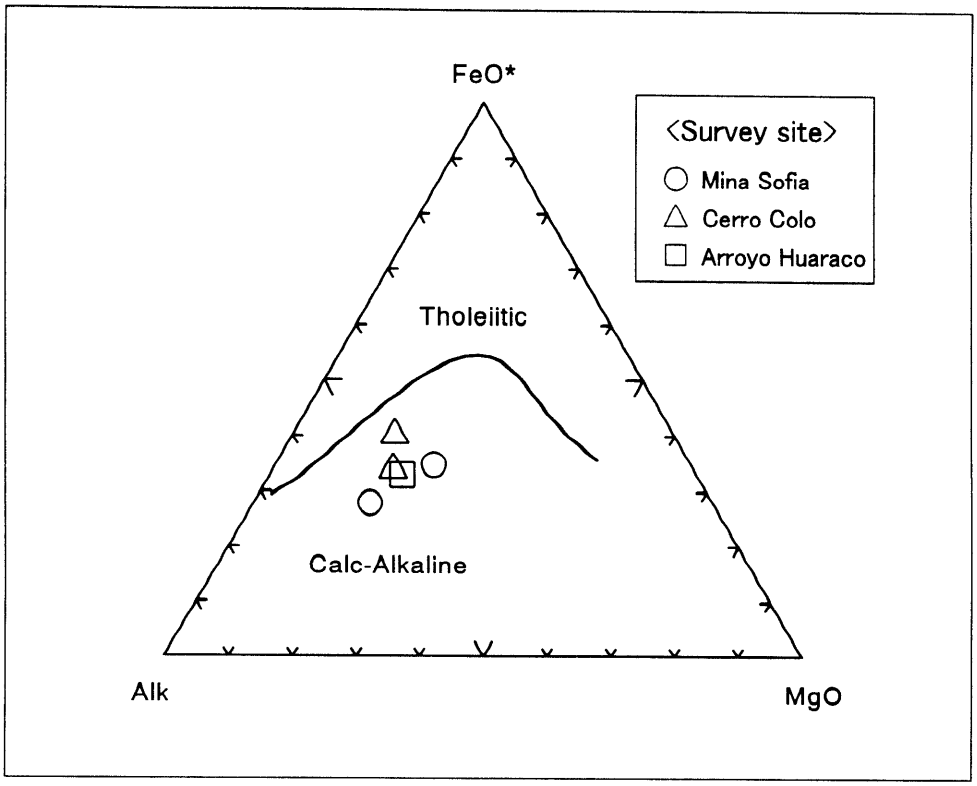


Fig. II-3-2-3c Ternary variation diagram of AFM plot for granitic rocks of the Andacollo district. Alk = Na_2O+K_2O, FeO^* = Total Fe in FeO.

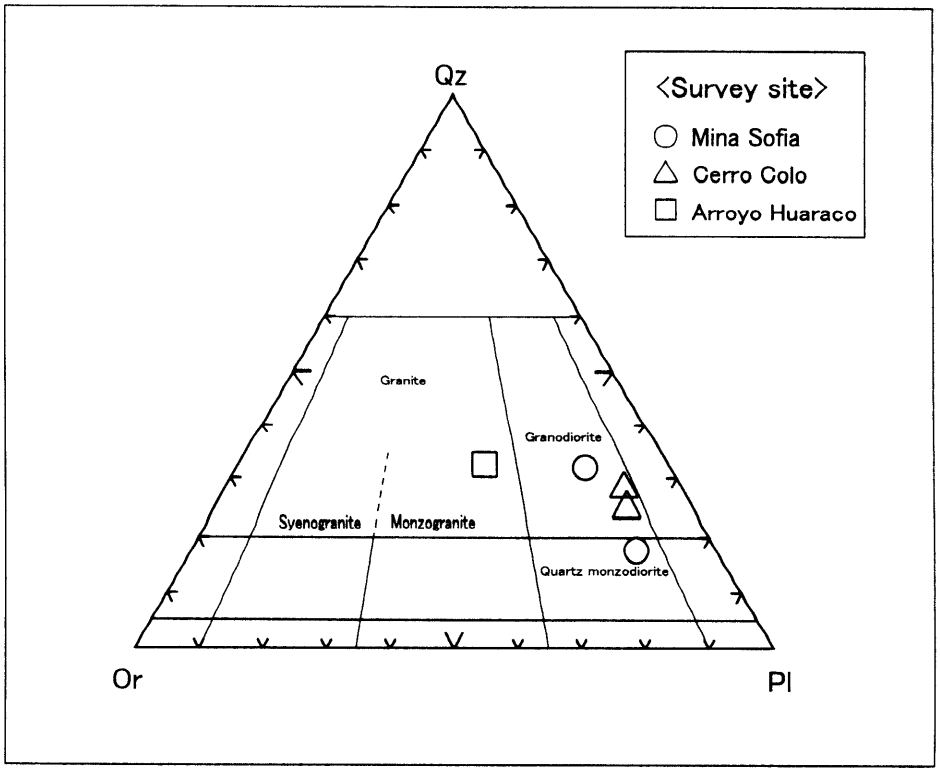


Fig. II-3-2-3d Ternary variation diagram of Qz-Or-Pl CIPW normative compositions for granitic rocks of the Andacollo district.

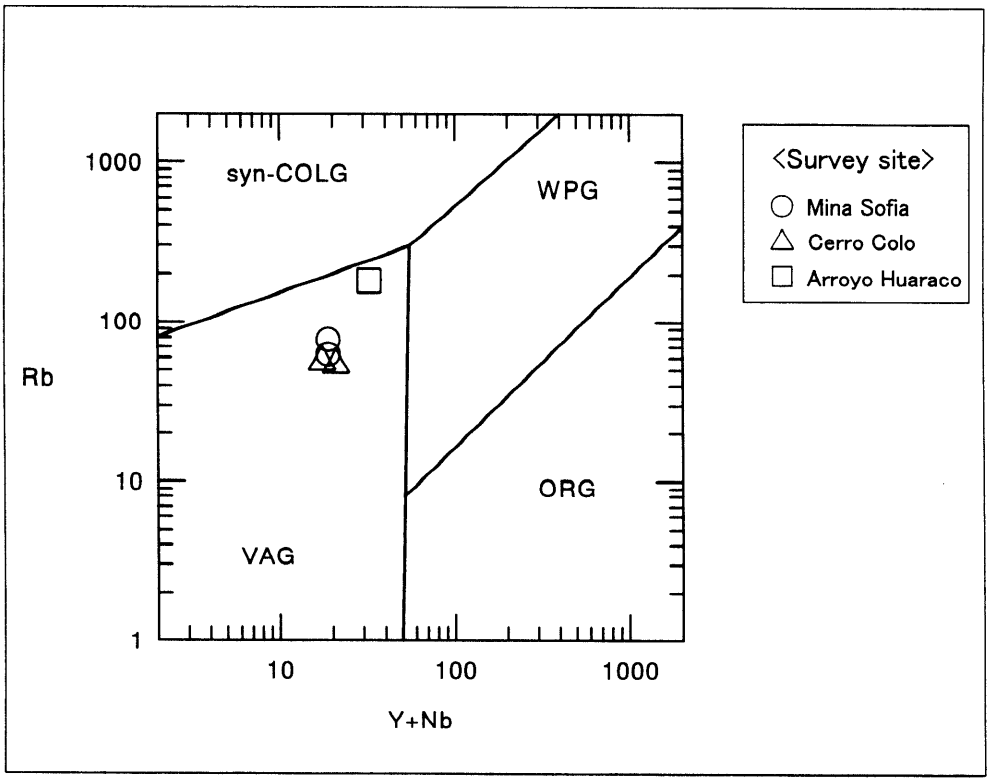


Fig. II-3-2-3e Rb - (Y+Nb) diagram for granitic rocks of the Andacollo district.
VAG : volcanic arc granites, syn-COLG : syn-collision granites,
WPG : within-plate granites, ORG : ocean ridge granites, (Pearce et al. 1984).

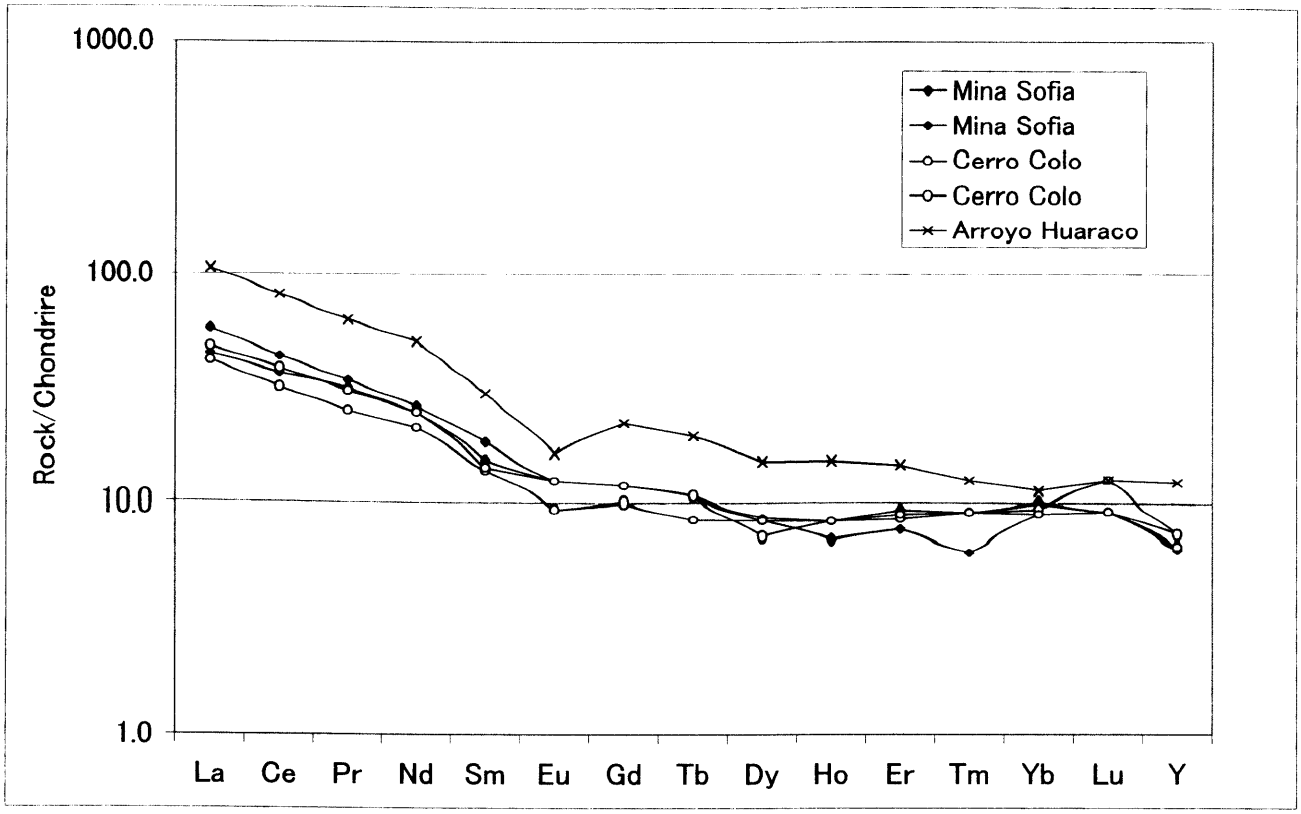


Fig. II-3-2-3f Chondrite normalized REE patterns for granitic rocks of the Andacollo district.

samples, and shows a characteristic that negative anormaly of Eu is remarkable. Four samples of Sofia deposits and Cerro Colo show an almost similar tendency. It is indicated from these results that granitic rocks in this district are island arc type calc-alkaline granite. In addition, it is recognized that Permian granite in Arroyo Huaraco has characteristics slightly different from those of granitic rocks in Sofia deposits and Cerro Colo.

Samples were also taken in silicified alteration zone to the south of Los Maitenes deposit and in sericite alteration zone with disseminated pyrite near La Premia deposit in order to carry out the chemical analysis. (Appendix-6). In the south to Los Maitenes deposit, the sample A00NK001 showed 270ppm Cu, while the sample A00MZ007 near La Premia deposit showed 0.165 g/t Au.

Argillized dacite sample A00MZ003 in Sofia deposits, sericite was identified by POSAM measurement, and quartz, chlorite, sericite, calcite and pyrite were identified by the powdery X-ray diffraction (Appendix-5). These results can be considered consistent.

10) Assessment

It is understood that there was igneous activities of calc-alkaline granite of the island arc type in this district and epithermal mineralization occurred in connection with the igneous activity. In Sofia deposits representing the mineralization of gold, it was confirmed that high grade gold ore exists in quartz and calcite veins accompanied by sulfides. In this district, mining activities by private companies is on-going, and high potentiality has been already proven. With consideration given to the purpose of this survey that new promising areas should be extracted, it is judged that this district is not necessary to be included in the Phase-2 survey.

3-2-4 Cerro Caicayén area

1) Location

This district is located about 20 km to the southwest of Chos Malal town in the northwest of Neuquen province (Fig. II-3-1). The area is lat. 37° 23' 24" to 37° 30' 36" S, and long. 70° 22' 48" to 70° 29' 24" W (Fig. II-3-2-4a), and about 170 km^2. The reprsentative cordinate is lat. 37° 26' 41.3" S and long. 70° 26' 45.1" W at the sampling point of A00RM010 in Quebrada del Bronce.

2) Topography and vegetation

Cerro Caicayen, 2,331 m above sea level, is composed of Paleogene intrusive surrounded by Jurassic sedimentary rocks. Cerro Caicayen is gently sloped. There are alteration zones in Quebrada del Bronce at 1,300 to 1,700 m sea level above. This district is located at the

northern limit of Patagonian steppe climate. The vegetation is sparse.

3) Access

It is about 30 minutes drive on No. 40 national road, No. 6 provincial road and local road from Chos Malal town to a farm at the foot of Cerro Caicayen. And it is about a 2 hours walk along Quebrada del Bronce from the farm to the alteration zones. Surveys are possible in all seasons.

4) Previous surveys

Dirección General de Minería of Neuqun province conducted the geochemical survey of 98 rock samples in alteration zones along Quebrada del Bronce in 1988. Average values of the analysis were 0.06 ppm Au, 0.78 ppm Ag, 6,406 ppm Cu and 83.41 ppm Pb. Maximum values were 0.6 ppm Au, 6.40 ppm Ag, 4.65 % Cu and 5,100 ppm Pb.

According to Franchini (1990), intrusive rocks of Cerro Caicayen are calc-alkaline series, SiO_2 content is 59.01% to 61.93%, average K_2O content is 1.31%, and average Al_2O_3 content is slightly high and shows the peraluminous tendency.

Placer Dome Exploration Inc. (1994) reported the anomalous area of more than 100 ppm Cu in the main part of phyllic and potassic zones, and suggested the presence of porphyry copper deposits.

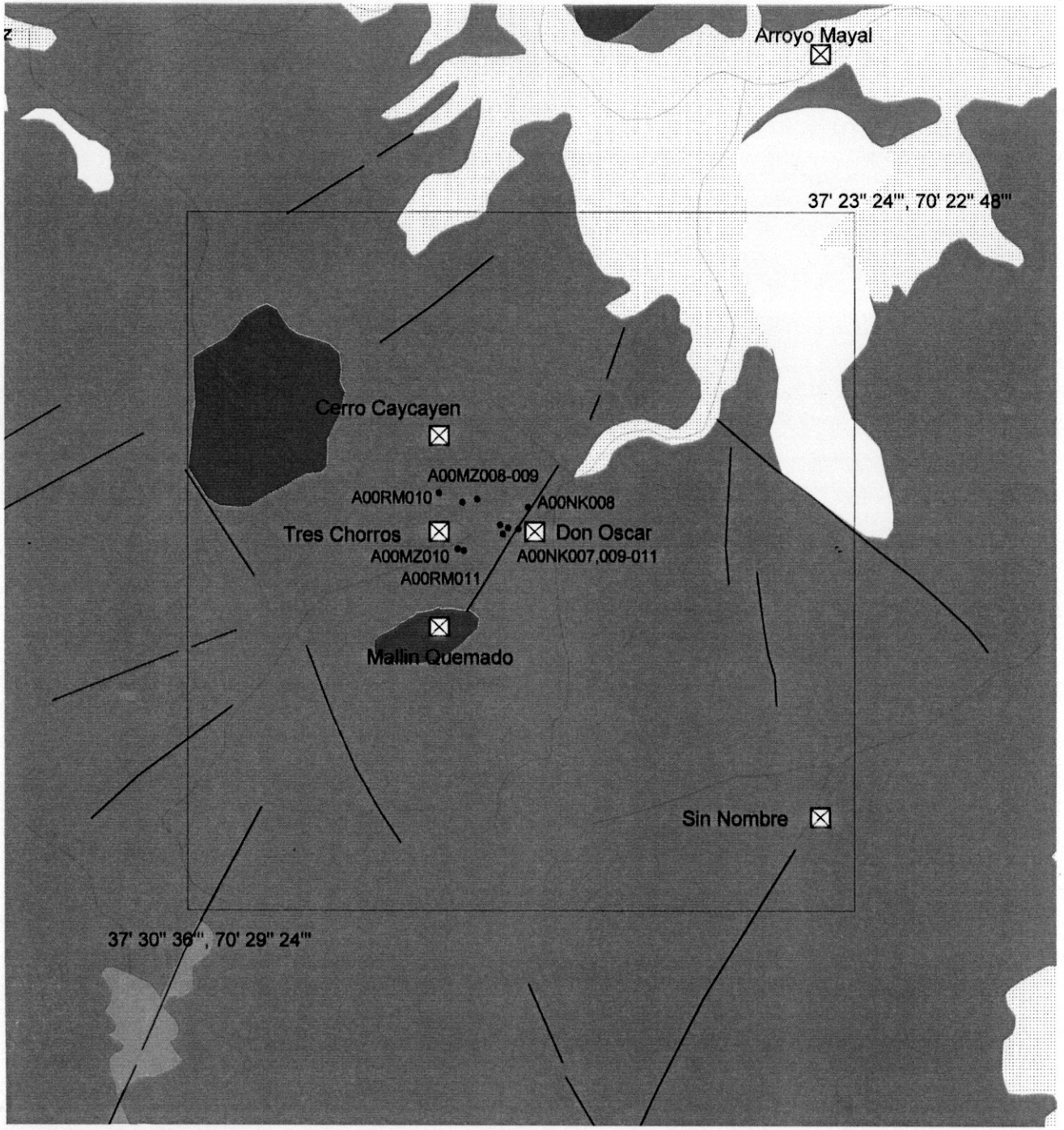
Gatro Argentina Minera S. A. conducted the geochemical survey of 267 stream sedements and 83 rock chips in 1995. Average values of the analysis were 44.8 ppb Au, 328 ppm Cu, 97 ppm As and 2.87 ppm Sb. An epithermal model was suggested from the value of arsenic. The chemical analysis was also carried out on small-sized massive skarn deposits in the southern boundary of alteration zones.

5) Mining properties

CORMINE S. E. P. holds the mining property named Bronce. This property is a rectangle of 6 km in E-W and 4 km in N-S.

6) Geology and geological structure

The main part of Cerro Caicayen is Paleogene intrusive and effusive rocks. The largest rock body including the mountain top is laccolith of micro quartz diorite of 6 to 7 km in diameter. Around Quebrada del Bronce where alteration zone is distributed, quartz diorite porphyry containing phenocryst of plagioclase intruded in the northeastern side of the stream, while sill of quartz dacite porphyry and quartz-hornblend andesite porphyry intruded in the southwest side. Sedimentary rocks into which these igneous rocks intruded belong to the Andes cycle period and Kimmeridgian to the lower Cenomanian of Jurassic. These comprise



Known deposit
Sampling point
Lineament
Circular structure
River
Lake

Legend

Quaternary sediments
Pliocene to Pleistocene basalt
Tertiary sedimentary rocks
Tertiary volcanic rocks
Tertiary granitoids
Jurassic to Cretaceous sedimentary rocks
Jurassic to Cretaceous volcanic rocks
Jurassic to Cretaceous granitoids
Permian to Triassic igneous rocks
Carboniferous sedimentary rocks
Proterozoic metamorphic rocks
Alteration zone

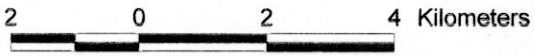


Fig. II-3-2-4a Geologocal map with sampling points of the Cerro Caicayen district.

in ascending order, Los Molles formation made of mudstone and limestone, Tabanos formation made of algae limestone and gypsum-like limestone, Lotena formation made of sandstone and conglomerate, La Manga formation made of limestone, Auquilco formation made of calacerous rocks and Tordillo formation made of sandstone, conglomerate and mudstone.

7) Mineralization and alteration

In Quebrada del Bronce, hydrothermal alteration zone of about 1 km^2 is distributed. The alteration is considered to be porphyry Cu deposit type. Jurassic sedimentary rocks intruded by quartz diorite and quartz andesite porphyry are silicified and argillized. Veinlets and dissemination of pyrite and limonite were observed in the alteration zone. As the results of POSAM measurement, montmorillonite and kaolinite were identified. In granitic rocks, weak argillization with disseminated pyrite and limonite were observed. In skarn deposits in the southern part, massive and network of pyrite and limonite were observed in the contact zone of 2 to 3 m width between limestone and dacite porphyry.

8) Characteristics of the satellite image

The geology was interpreted as intrusive rocks of α Ti (Ecocene to Palaeocene), sedimentary rocks of Kis1 (Lower Cretaceous) and sedimentary rocks of Jss (Upper Jurassic). Color tones of the false color image range from grayish white to whitish brown. The structure due to topographic undulations is fine to rough, and water systems are in parallel or arborescent with moderate to high densities. Ridges are clear to unclear with different resistances. The bedding planes of sedimentary rocks develop well. Intrusive rocks are massive. Dominant lineaments orient to the NE-SW and one lineament in the NNW-SSE direction is also extracted. On ratio image, alteration zone shows bright reddish purple color while the color tone is lighter than that of Andacollo district.

9) Laboratory work results

As the results of the chemical analysis of samples A00NK007, A00NK010, A00MZ008, A00MZ009 and A00RM011, A00NK007 showed 3,350 ppm Mn and 1,670 ppm Zn, but noticeable values were not obtained from other samples (Appendix-6).

The analysis result of ore sample of A00MZ010 showed more than 30% Fe, while noticeable values were not obtained from other samples (Appendix-9)

10) Assessment

Porphyry copper deposits and skarn deposits were expected in the alteration zone based on the previous exploration results. However, remarkable mineralization of copper could not be confirmed while hydrothermal alteration was confirmed. No noticeable results were

obtained from the chemical analysis of rock and ore samples. Therefore, Phase-2 survey for this district is not considered necessary.

3-2-5 Cerro del Diablo district

1) Location

This district is located about 30 km to the southwest of Chos Malal town in the northwest of Neuquen province (Fig. II-3-1). The area is lat. 37° 34' 48" to 37° 42' 36" S and long. 70° 22' 12" to 70° 30' 00" W (Fig. II-3-2-5a), and about 200 km^2. In the area of Cerro del Diablo, copper deposits and barite deposits are located The coordinate of the copper deposits is lat. 37° 38' 21.5" S and long 70° 25' 48.5" W. And the coordinate of the barite deposits, which is located about 2 km to the west of the copper deposits, is lat. 37° 37' 43.4" S and long 70° 25' 58.8" W.

2) Topography and vegetation

This district is located in the mountains of 1,500 to 2,000 m above sea level. Cerro del Diablo is 2,195 m sea level above, copper deposits is located around the summit and barite deposits is located around the middle slopes to the foot of the western ridges of the summit.

Thin forest spread in the valleys of low elevation. Short grasses sparsely grow from the middle slopes to the summits. The water system distribution is low in density and has no clear directions. The directions of ridges are not clear either. Macroscopically, the water system and mountain ridges in this area show N-S trending.

3) Access

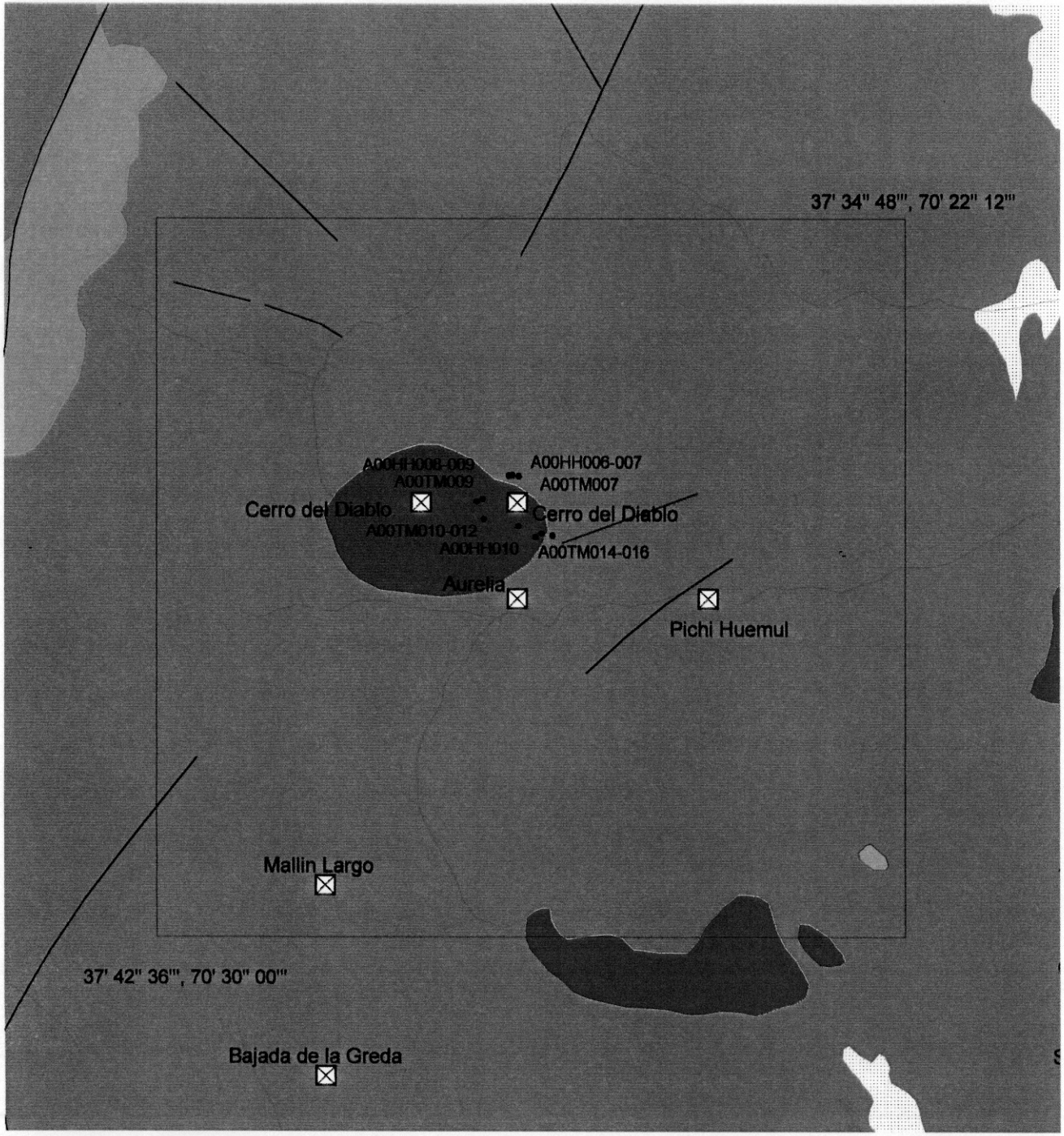
It is about 55 km drive on No. 40 national road to south from the Chos Mala town, then drive to west on unpaved No. 4 and No. 29 provincal roads to the foot of Cerro del Diablo. After that, it is several kilometers drive to barite deposits by bad condition road that 4-wheel vehicle is only available. Totally, it is 85km and 2.5 hours drive from the Chos Mala town.

4) Previous surveys

Known deposits in this district and peripheral area are shown in Fig. II-3-2-5a. In this district, besides the copper and barite deposits in Cerro del Diablo, there are Aurelia, Pichi Huemul and Mallin Largo of base metals and iron deposits. Moreover, geological mapping in the scale of 1/ 200,000 was carried out covering this district (Llambías et al., 1978).

In the barite deposits, old adits are remained. CORMINE (1996) reported that mineralization of chalcopyrite, sphalerite and galena in addition to barite.

In the copper deposits, CORMINE S.E.P. conducted exploration. The copper deposits have an area of 4 km x 4 km. It is considered that hydrothermal alteration and mineralization



N

Known deposit
Sampling point
Lineament
Circular structure
River
Lake

Legend

Quaternary sediments
Pliocene to Pleistocene basalt
Tertiary sedimentary rocks
Tertiary volcanic rocks
Tertiary granitoids
Jurassic to Cretaceous sedimentary rocks
Jurassic to Cretaceous volcanic rocks
Jurassic to Cretaceous granitoids
Permian to Triassic igneous rocks
Carboniferous sedimentary rocks
Proterozoic metamorphic rocks
Alteration zone

2 0 2 4 Kilometers

Fig. II-3-2-5a Geologocal map with sampling points of the Cerro del Diablo district.

of the dissemination type, which were controlled by the fissure system, generated by the igneous activity of Cretaceous to Tertiary. Mineralization was reported as the occurrences of chalcopyrite, tetrahedrite, pyrrhotite, pyrite, galena, sphalerite and barite (CORMINE, 1996). Geochemical anomalies of gold, silver, copper and molybdenum were also reported by the geochemical survey (Mining Secretary, 1993).

Old three trenches exist in the barite deposits; they are 20 m length, 2 m width and 1 m depth in E-W direction. In the copper deposits, there are old intermittent trenches of total about 2,000 m; they are 2 m width and 1.5 to 2 m depth in N 75° E direction.

5) Mining properties

CORMINE S. E. P., a mining public corporation of Neuquen province and private companies own several mining properties.

6) Geology and geological structure

The geology of this district comprise, in ascending order, Jurassic calcareous mudstone and shale of Vaca Muerta formation, Cretaceous sandstone of Mulichinco formation and Paleogene andesitic rocks. Granitic rocks and andesite such as Paleogene quartz diorite (48.4 Ma) intruded into Jurassic to Cretaceous sedimentary rocks.

In the Jurassic to Cretaceous sedimentary rocks, many anticlinal axes oriented to the NNW-SSE were extracted from the satellite image analysis.

Granitic rocks are small-sized stock with strike of E-W and dip of 10° N in barite deposits. Changes of lithofacies are remarkable and aplitic fine granite is distributed in the barite deposits. Porphyrytic andesite and granite stock of a small scale intruded on the summit of Cerro del Diablo.

7) Mineralization and alteration

In the barite deposits, silicified and argillized alteration are recognized in shale, locally with dissemination of pyrite. Barite veins show the structure of N 10° W and 85° E and have the width of 10 m to 15 m. Kaolonite and smectite were identified for the shale of vein side, and kaolinite was identified for the altered granite around the old adits by POSAM measurement.

Inside trenches in the copper deposits, disseminated azurite, chrysocolla and malachite were observed. Copper mineralization continues intermittently about 200 m along the trenches. Well mineralizaed part has a size of about 30 m extension and 3 m width. Types of alteration are silicification, whitened argillization and limonitization. Width of the alteration is 20 to 30 m centering the trenches. Vein-like silicification zone exist along the contact between shale and small granite stock, partially it is accompanied by copper mineralization.

Particularly, the periphery of the trenches has notable gossan. It has 400 m extension and maximum 40m width. Kaolinite and sericite were identified by POSAM measurement and powdery X-ray diffraction for white clay from inside of trenches.

8) Characteristics of the satellite image

Two lineaments in the NEE-SWW direction were extracted near Cerro del Diablo. In the periphery, NW-SE and NE-SW lineaments are dominant. There are no recognized color anormaly indicating the hydrothermal alteration on the ratio image.

9) Laboratory work results

Barite vein (A00TM007) and vein side host rocks (A00HH007, A00TM008) were taken in the barite deposits, however, no noticeable chemical analysis results were not obtained. Kaolin and gypsum were identified by powdery X-ray diffraction for argillized shale from vein side.

Mineralized samples (A00TM014, A00TM016) were taken in the copper deposits. A00TM014 revealed 0.11 g/t Au, 3.8 g/t Ag, 3.2% Cu, 40 ppm Pb and 150 ppm Zn. On the other hand, A00TM016 revealed anomalous value of 81.2 ppm Hg. Sericite and kaolinite were identified by powdery X-ray diffraction for silicified and argillized granitic rocks.

Concerning the sample taken from a trench between the copper deposits and barite deposits, silicified and argillized shale (A00TM010) revealed 0.545 g/t Au, 46 g/t Ag, 1,010 ppm Cu, 7.1% Pb, 3,170 ppm Zn, 20.6 ppm Hg and >1% As. Arsenic and mercury contents are anomalous. Sericite and kaolinite were identified by the powdery X-ray diffraction for silicified and argillized shale (A00TM011) from the same point.

Biotite and hornblende granodiorite porphyry (A00TM009) was taken for K-Ar radiometric dating in the barite deposits. Measurement was done for the separated plagioclase and value of 53.8 ± 3.0 Ma was obtained.

The result of the chemical analysis of the above-mentioned sample A00TM009 shows that it is calc-alkaline granite, as shown in the AFM diagram (Fig. II-3-2-5b) and is plotted near the border between granodiorite and tonalite in the Qz-Or-Pl diagram (Fig. II-3-2-5c). It is also plotted in the area of volcanic arc granites in the Rb-(Y+Nb) diagram (Fig. II-3-2-5d). REE chondrite normalized pattern (Fig. II-3-2-5e) shows that the granitic rock of this district has more light rare earth elements (La to Sm) and less heavy rare earth elements (Gd to Lu) than the granitic rocks of the Andacollo district. This tendency means that the granodiorite in this district is more differentiated than that in Andacollo district. This is concordant with the fact in the field that granitic rocks intruded as small stocks.

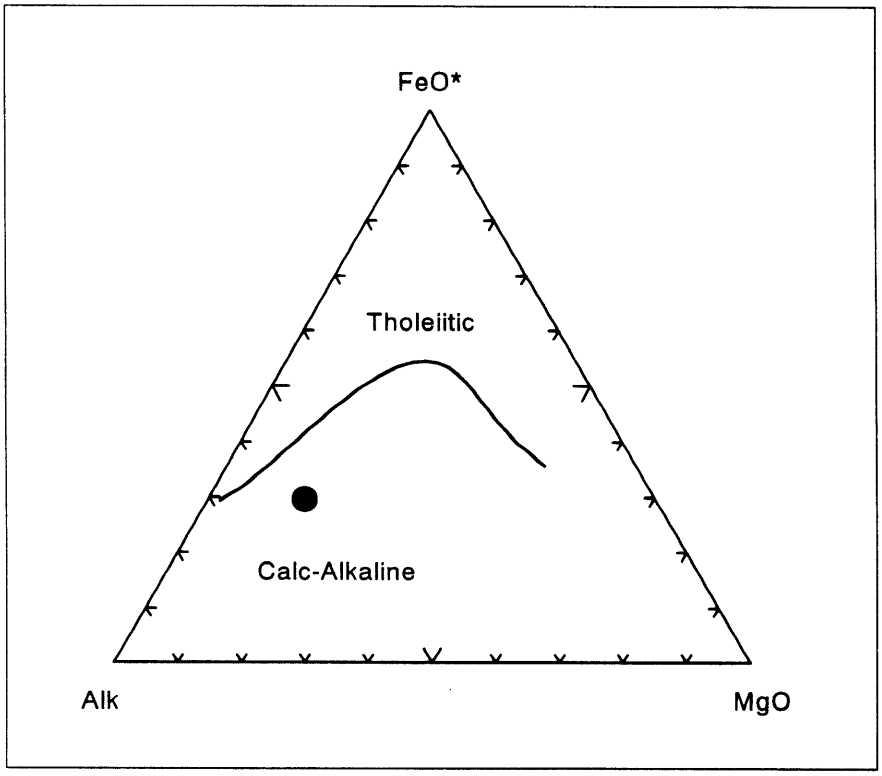


Fig. II-3-2-5b Ternary variation diagram of AFM plot for granitic rock of the Cerro del Diablo district.
Alk = Na_2O+K_2O, FeO^* = Total Fe in FeO.

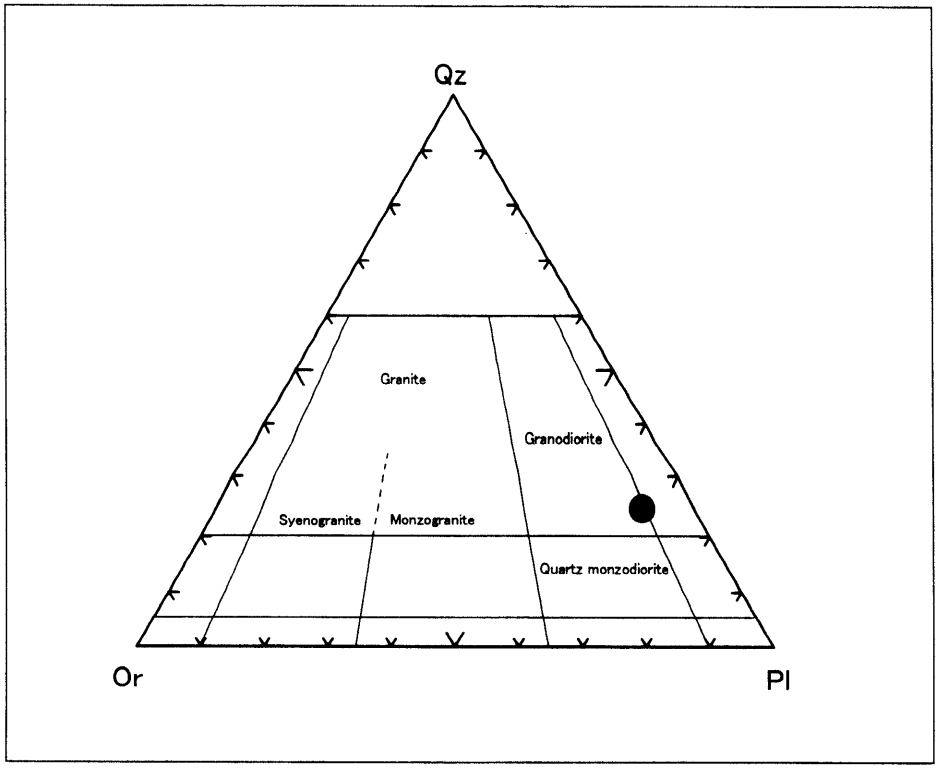


Fig. II-3-2-5c Ternary variation diagram of Qz-Or-Pl CIPW normative compositions for granitic rock of the Cerro del Diablo district.

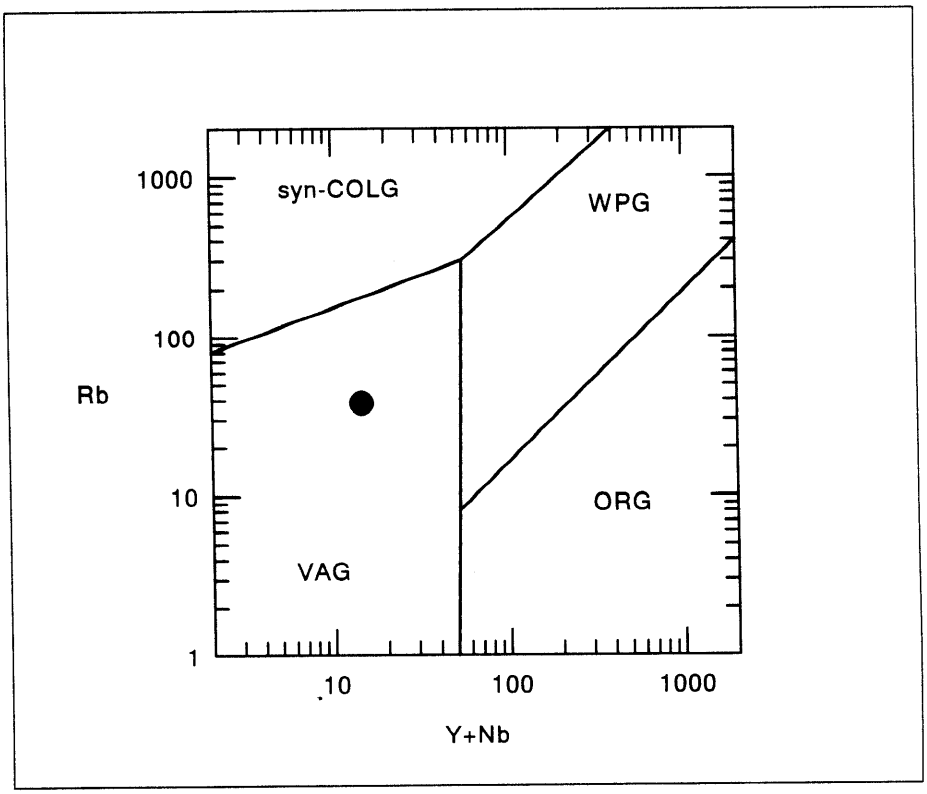


Fig. II-3-2-5d Rb - (Y+Nb) diagram for granitic rock of the Cerro del Diablo district. VAG : volcanic arc granites, syn-COLG : syn-collision granites, WPG : within-plate granites, ORG : ocean ridge granites, (Pearce et al. 1984).

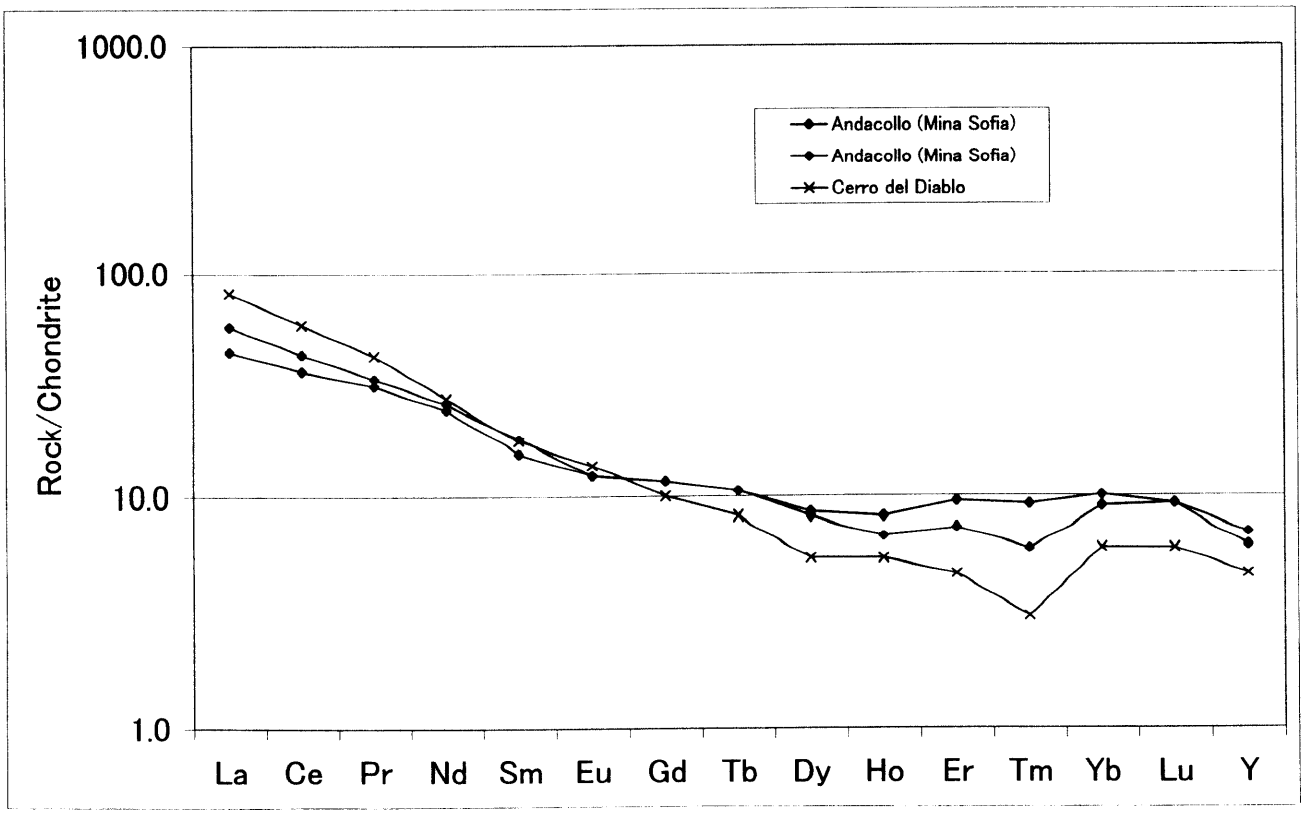


Fig. II-3-2-5e Chondrite normalized patterns for granitic rocks of the Cerro del Diablo district compared with the Andacollo district.