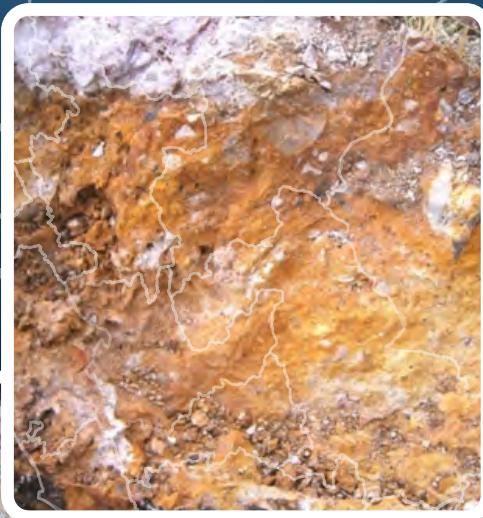
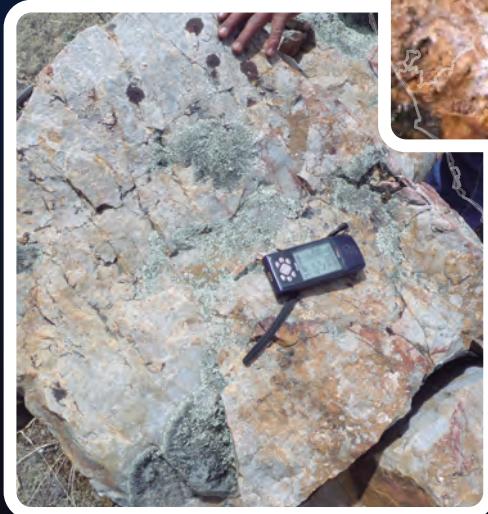




# DISCOVERING NEW PROSPECTS FOR EXPLORATION IN AREAS OF NON- ADMISSION OF MINING CLAIMS



LIMA - PERU  
2020



## Location and access

It is located in southern of Peru, approximately 530 km southeast of Lima, in Pataypampa district, province of Grau in the region of Apurimac. Its central coordinates UTM-WGS84 (Zone 18) are 8'430,000 N and 752,000 E, with an average altitude of 4,000 m.a.s.l. (Figures 1 and 2).

## ANTABAMBA BLOQUE 3 Porphyry Cu - Au prospect



Figure 1. Location of Antabamba Bloque 3. Apurimac



Figure 2. Panoramic view of Antabamba Bloque 3

## Geological setting

Geologically, it is located within the area of influence of Andahuaylas-Yauri Batolito site. This is a highly prospective area for the existence of mineral resources related to copper porphyry deposits and skarns areas.

Cretaceous units such as the Hualhuani Formation of the Yura Group, Murco Formation and Arcurquina Formation (Ferrobamba limestones) are distributed in this area. Felsic intrusive rocks from Oligocene cut these units (tonalite-granodiorites) and quartz-monzonite intrusive. In that way, this generates mineralized structures in the sandstones of the Hualhuani Formation.

## Alteration and Mineralization

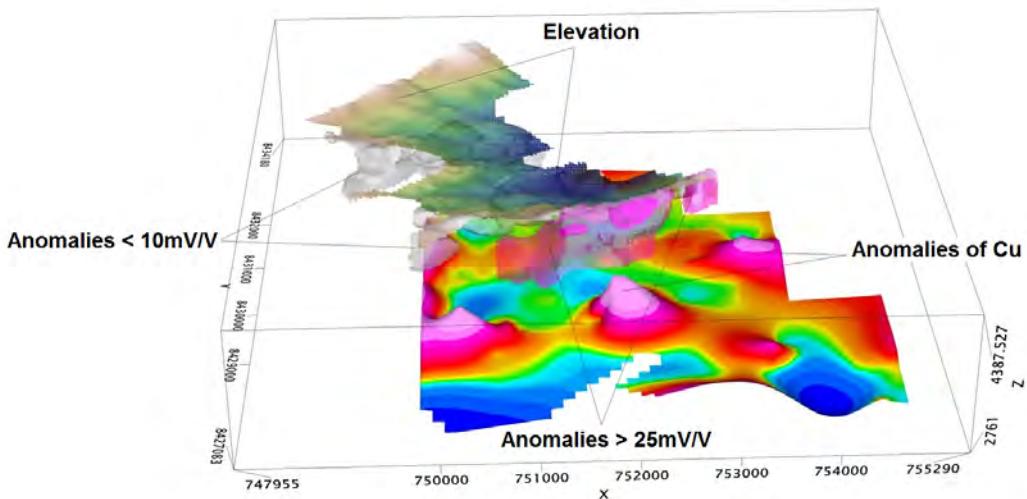
Five types of hydrothermal alterations were recognized: quartz sericite pyrite, silicification, propylitic, granular silica and argilization. Mineralization occurs in the three following ways: breccia filled with iron oxides and sulfides, veins type stockwork and disseminated. The last one is the most notorious in the intrusive rocks that outcrop southern ANAP.

## Geochemistry and geophysics

Geochemical results show high values of up to 5 g / t of Au and 1166 ppm of Cu, although, the sandstones that cover the area do not show results of interest, they present an intense fracturing and brecciation.

The results of the geophysical survey between the sectors of C° Rumeorco-Totorapampa and part of the C° Wyllama-San Marcos indicate a high content of polarizable material. It is due to the presence of disseminated sulfides with an important range of 25- 40mV / V. Besides, this chargeability anomaly has an approximate length of 1.2km x 1.4km, as shown at a level of 300m deep.

Based on the recognized alterations and the high values for copper and gold in structures and breccia, it could have in depth a blind Cu-Au Porphyry system related to the intrusives of quartz - monzonite composition that outcrop to the south of the area (Figure 3).



**Figure 3.** Cu anomaly on surface coinciding with the chargeability anomaly (>25mV/V) in depth.

## Location and Access

It is located in southern of Peru, approximately 522 km southeast of Lima in Chuquibambilla district, Grau province and region of Apurímac. Its central coordinates UTM-WGS84, Zone 18 are: 8°43'7,000 N and 734,000 E, with an average altitude of 4,000 m.a.s.l. (Figures 1 and 2).

## HUISANI Porphyry Cu – Mo - Au prospect

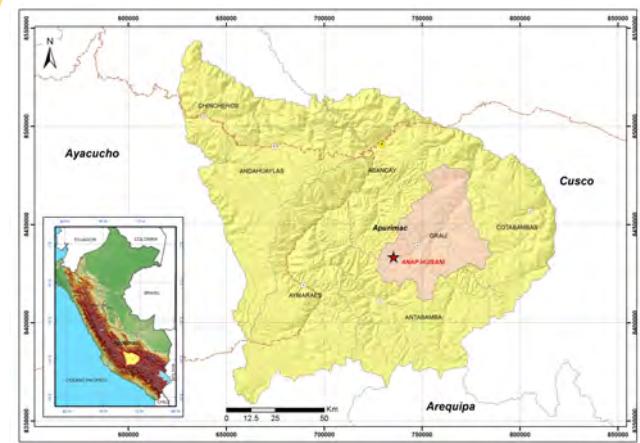


Figure 1. Location of Huisani. Apurímac.

## Geological Setting

Geologically, it is located within the area of influence of Andahuaylas-Yauri Batholith. This is a highly prospective area for the existence of mineral resources related to copper porphyry deposits and skarns areas.

Cretaceous sedimentary units of the Socoani Formation, Yura Group, Murco Formation and Arcurquina Formation (Ferrobamba limestones) are recognized. The intrusive rocks of this region are constituted by Andahuaylas-Yauri Batholith of lower Oligocene age, which is formed by large bodies of granodiorite, tonalite and diorite, intruded by Oligocene-Miocene andesitic, dacitic and monzodioritic rocks related with mineralization.

## Alteration and Mineralization

Four types of hydrothermal alterations were recognized: propylitic, argilization, silicification and skarn. The mineralization is shown in veins and disseminated. Magnetite veins in Tuya sector and remnants of Pb and Zn sulfide structures in Asnapuquio sector. Type disseminated in the monzodioritic porphyry in contact with limestones of the Pucaorcco sector and in the limestones of the Socoani Formation of the Asnapuquio sector; the first presents disseminated pyrite with traces of chalcopyrite and the second Zn mineralization recognized by the staining method.

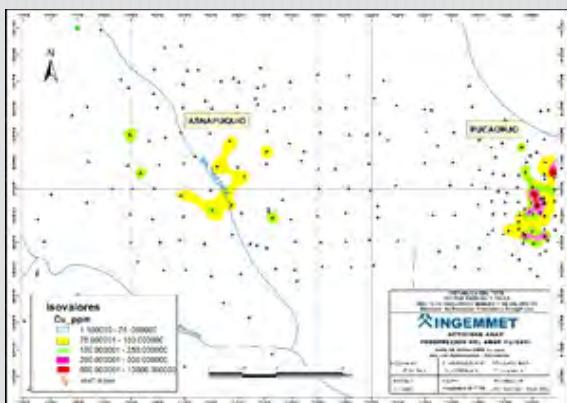


Figure 2. Panoramic View of Pucaorcco Mountain in Huisani.

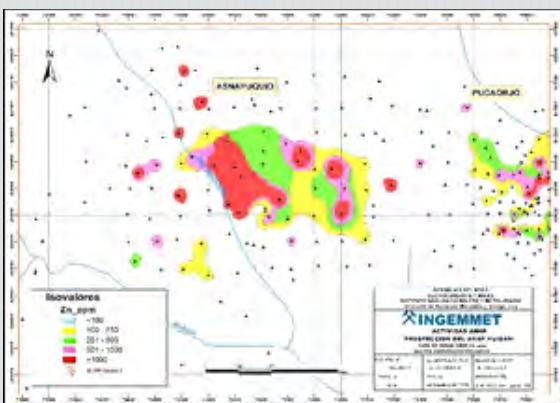
## Geochemistry and geophysics

Two well-defined sectors of interest were recognized: Sector Pucaorcco in Cu-Mo and Asnapuquio sector in Zn and Mo. In Pucaorcco, the intrusive in contact with limestones is exposed and the results show values up to 9310 ppm\_Cu, 132 ppm\_Mo, 3910 ppm\_Zn. In Asnapuquio, the outcropping limestones show values of 3310 ppm\_Zn, 204 ppm\_Mo (Figures 3 and 4).

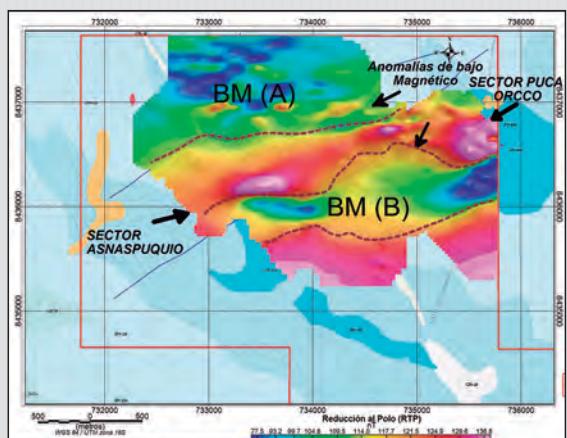
Geophysical prospecting studies show a low NE-SW magnetic susceptibility lineament between the Pucaorcco and Asnapuquio sector. They also have a chargeability, in the range of 25-50mV / V that reach until 400m. In Pucaorcco, the most likely corresponding to the monzodioritic porphyry and in the Asnapuquio sector indicate a possible intrusive body charged with disseminated sulphides. In accordance with the geochemical values obtained on the surface, it would be a possible porphyry Cu – Mo deposit (Figures 5 and 6).



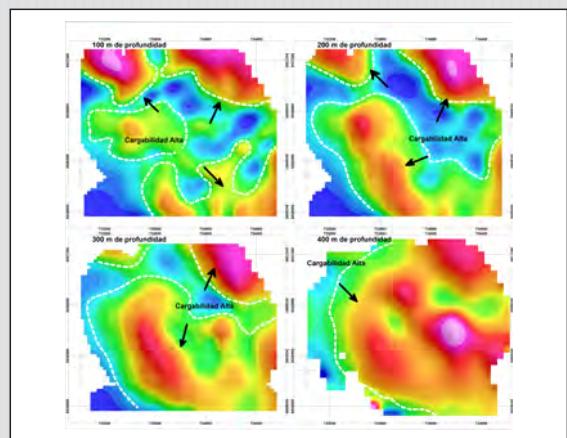
**Figure 3.** Cooper isovalues in Asnapuquio and Pucaorcco sectors.



**Figure 4.** Zinc Isovalues in Asnapuquio and Pucaorcco sectors.



**Figure 5.** Magnetic susceptibility composite.



**Figure 6.** Composite of chargeability in ANAP Huisani at -300 m Line 1200 Pucaorcco sector.

## Location and Access

It is located in the district of Quicacha, province of Caravelí in Arequipa, and it covers 8,100 hectares. It is accessible from Lima, through the South Pan-American Highway to the city of Chala (614 km.), and then continues to the towns of Cháparra and Quicacha. From there, you can access the work area in 1 hour 30 minutes approximately (Figure 1).

## CHAPARRA BLOQUE 4 Porphyry Cu – Mo – Au prospect



Figure 1. Location and access of Chaparra Bloque 4. Arequipa.

## Geological setting

There are andesitic lavas of upper Jurassic age of Rio Grande Formation, quartz monzonites of upper Cretaceous age of Linga Super Unit, granodiorites of lower Cretaceous age of Tiabaya Super Unit and crystalline tuffs of Alpabamba Formation. These tuffs cover much of the south flank of “bloque 4”. In the northern part, Alpabamba Formation is found as remnants.

The structures identified concern the Calpa fault of NW-SE direction and dextral movement. This structure has generated a series of minor E-W tensional faults. In some cases, they hosted quartz veins and veinlets with sulfide contents, in addition to aplitic dykes.

## Alteration and Mineralization

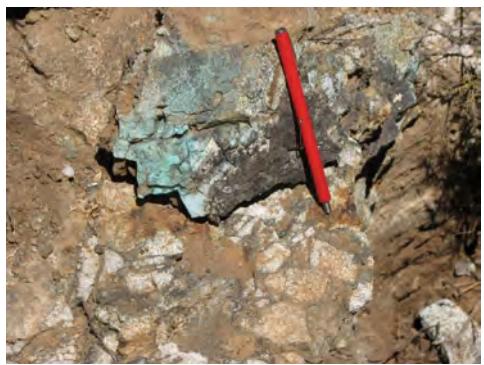
In addition of some veins with restricted haloes of argillic-propylitic, on the NW flank it was observed a potassium alteration that affects the diorite-granodiorite through stockwork. It was surrounded by a sericitic halo of 1000 mx 800 m, related to a possible Cu-Au porphyry system (Figure 2).

Likewise, tourmaline pipe bodies have been identified, with clasts of intrusive rock and matrix of the same component, besides of sulfides and copper oxides.

Mineralization contains pyrite and chalcopyrite in disseminated type and veinlets, mostly leached (Figure 3).



**Figure 2.** Potassium alteration in intrusive rock, with stockwork type veins and oxides filling product of sulphide leaching.

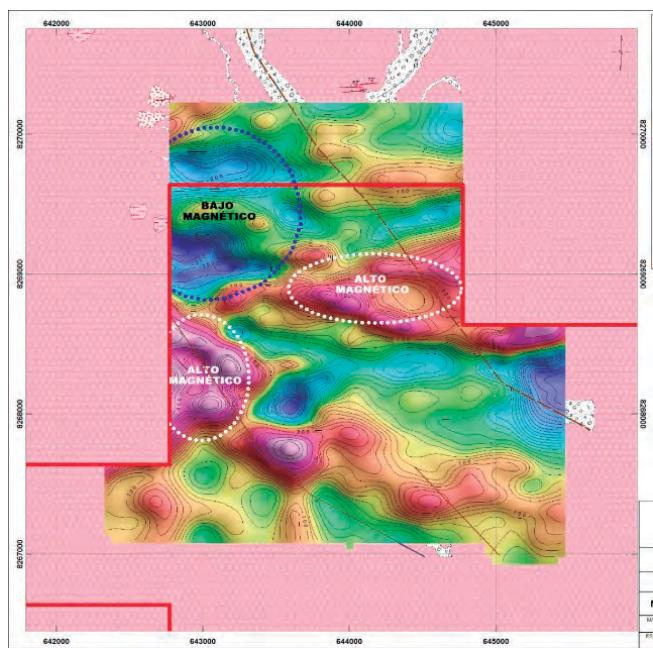


**Figure 3.** Breccia with copper oxides and tourmaline in the matrix.

## Geochemistry and geophysics

The results of geology, geochemistry and geophysics show the possible porphyritic system related to Cu (with values of 485-703 ppm), Mo (up to 665 ppm) and Au (up to 312 ppb) mineralization. This becomes an interesting zone in the area, because in the vicinity there are other prospects located to the north such as Marcahuí and Duraznillo.

The collection of geophysical data on the NO flank has allowed us to characterize three physical parameters: the magnetic field, the resistivity and chargeability of the rocks. The IP2D study has provided chargeability information with important ranges of  $\sim 20\text{--}40$  mV / V. It covers an area of  $0.8\text{ km} \times 0.8\text{ km}$  approximately with a Northwest-Southeast orientation. Chargeabilities are presented from 50m and go deeper than 400m, that is a direct response of anomalies related to disseminated sulfides of a possibly porphyry Cu – Mo – Au target (Figure 4). Likewise, the resistivity response has contributed to identifying two sectors: the first from moderate to high resistivities and the other sector of low resistivities.



**Figure 4.** High and low magnetic anomalies, related to a possible porphyry system.

### Location and access

It is located 130 km NE of Lima, in Pacho, Checras and Andajes districts that correspond to the provinces of Huaura and Oyón of the region of Lima. With the central coordinates UTM-WGS 84 Zone 18 south; 291,680 E, 8'792,980 N with a maximum altitude of 4,715 m.a.s.l. (Figure 1).

### ZONA 2 VMS – Cu Zn Prospect

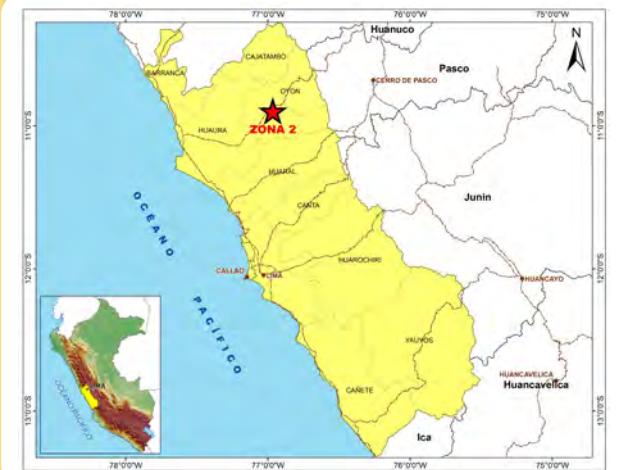


Figure 1. Location of Zona 2. Lima

### Geological Setting

Four lithological domains were identified. The first one of marine sedimentary nature formed at the base by silty argillite and sandstones with calcareous intercalations that belong to Chicama Formation (Jurassic). Then, the second domain, represented by volcano-sedimentary rocks of Casma Group (Lower Cretaceous), is formed by andesites, tuffs, fine sandstones and conglomerates. The third domain is defined by the pyroclastic rocks of Calipuy Group (Cenozoic), and it is composed of andesites and tuffs. Finally, the fourth domain is formed by diorite – tonalite and diorite rocks that correspond to Oligocene Colcabamba y Tongos Plutón.

### Alteration and mineralization

The hydrothermal alterations are of silica-argillic and the propylitic type in the border. It is associated with pyrite and pyrrhotine mineralization in a disseminated and semi-massive form, in addition to calcite. These are exposed in the base and edges of the ravine, caused by the strong erosion generated by a very rugged topography. Locally and towards the peripheries, there are barite and calcite especially in Qulash Sector.

Three prospective sectors were identified with mineralization style of VMS volcanogenic massive sulphides type located in rocks of Casma Group: Qulash, Chinchipuquio and Ayaranga. The first two sectors have siliceous alteration, fine dissemination of pyrite, pyrrhotine and traces of chalcopyrite, as well as gossan (goethite and hematite), with barium anomalies. The third sector is very similar to the previous ones, especially the areas of Chilgante, Condorccayan and Jaraccoto.

## Geochemistry and geophysics

In Qulash sector, the geophysical results confirm in depth anomalies of low magnetic, chargeability and typical resistivities of a VMS deposit. On the surface, there are anomalies for Zn (up to 4521 ppm), Cu (up to 1935 ppm), Ba (up to 1653 ppm), Sb (up to 303 ppm), Cd (up to 81 ppm) and Mn (greater than 1000 ppm). The chargeability anomaly ranges from 14 to 26.4 mV / V and it is noticeable from 50 m and persists up to 500 m.

In Chinchipuquio sector, geophysical prospecting was carried out towards the southwest and northeast sector. In addition, anomalies of low magnetic, chargeability and resistivity, very similar to the previous sector were identified. Besides, there are anomalous values for Zn, Cu, Ba and Sb. The chargeability ranges from 15 to 30.1 mV / V and notorious from 50 m, persisting up to 500 m deep.

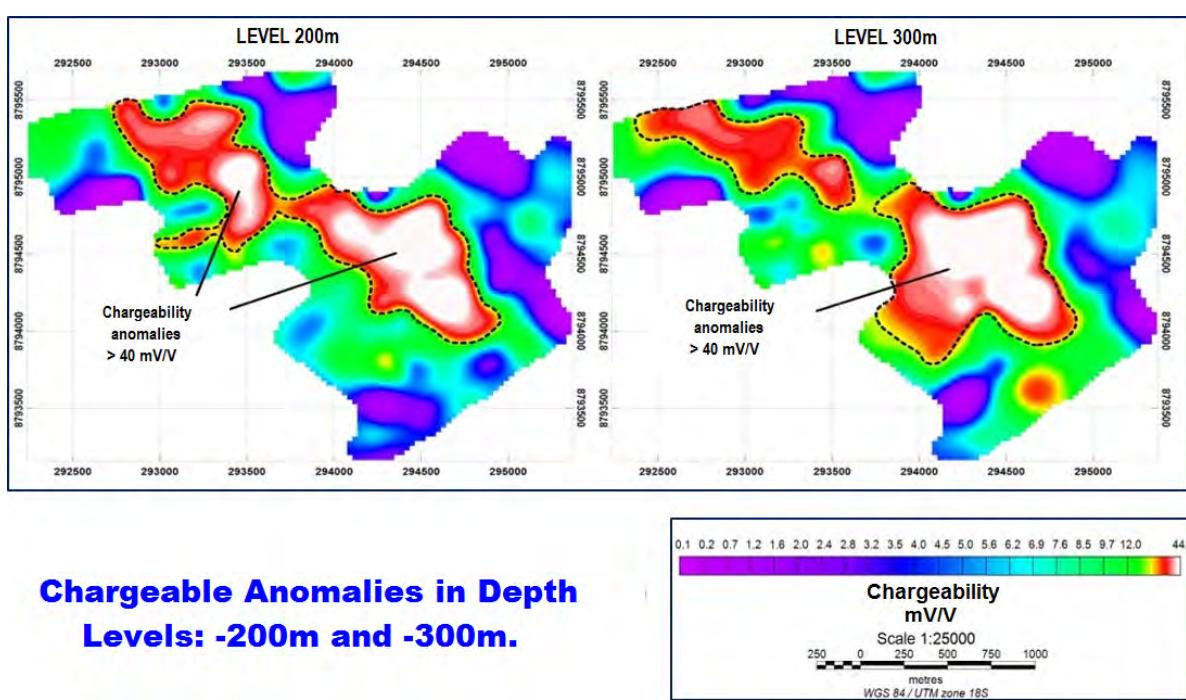


Figure 2. Chargeability anomalies (-200 and -300 m) in Qulash and Chinchipuquio targets.

## Location and access

It is located in southern of Peru, Circa district, Abancay province of Apurimac. It is approximately 500 km from Lima. Its central coordinates UTM-WGS84, Zone 18 are: 8°446,000 N and 724,000 E, with an average altitude of 4,200 m.a.s.l. In addition, it is within the Metallogenetic Belt "Cu-Mo (Au-Zn) porphyry-skarn and Eocene Oligocene intrusive-related Cu-Au-Fe deposits (Andahuaylas-Yauri Batholith)". (Figure 1 and 2).

## ANTABAMBA BLOQUE 2

Porphyry Cu - Au prospect



Figure 1. Location of Antabamba Bloque 2. Apurimac.

## Geological setting

The geology is mainly represented by an igneous-plutonic environment. It belongs to the Andahuaylas-Yauri Batholith of Oligocene age, and it is constituted by diorite, granodiorite, monzodiorite quartz and monzonite quartz rocks. The main identified faults are: Aysacocha and Huamansalcca of Andean direction, which control the Cu-Au-Ag mineralized structures.

## Alteration and mineralization

Hydrothermal alteration is restricted to vetriciform structures and veinlets, such as, quartz-sericite, propylitic and silicification. The mineralization styles consist of veins, breccia, veinlets and punctually dissemination. The main minerals are: chalcopyrite, molybdenite, pyrite, malachite and iron oxides.



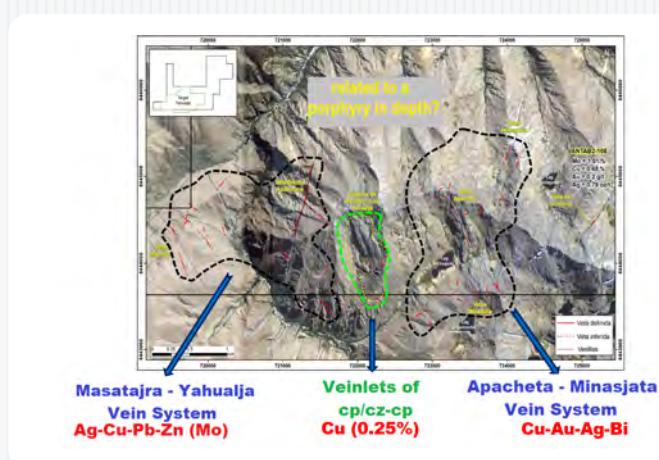
Figure 2. Panoramic view of Aysacocha.

\*Areas reserved for the Peruvian State, in which INGEMMET has carried out regional mining prospecting works, close to being finished off.

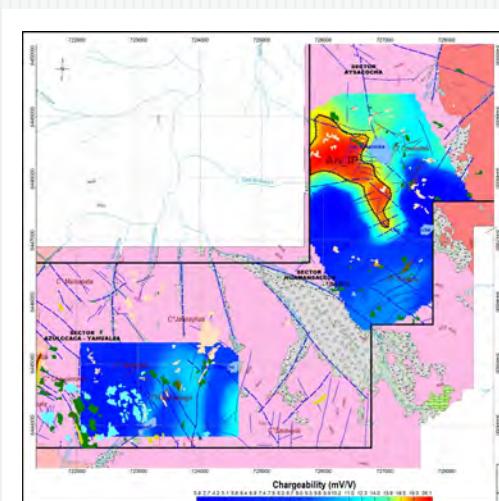
Geochemistry and geophysics

Geochemical anomalies are identified in rocks, such as: Au > 30 ppb, Ag > 1 ppm, Cu > 100 ppm, Mo > 15 ppm, W > 15 ppm, Pb > 50 ppm and Zn > 90 ppm. In vetriciform structures, there are Au up to 81 ppm, Ag up to 330 ppm, Bi up to 2774 ppm, Cu up to 6.7%, Mo up to 1.01% (punctual), W up to 865.3 ppm, Pb up to 3961 ppm, Zn up to 2970 ppm and As up to 3942 ppm. (Figure 3.)

In Aysacocha-Huamansalcca Target has been confirmed in depth anomalies of low magnetic, chargeability and resistivity typical of a porphyry deposit. As an evidence, it has Cu-Au-Ag mesothermal veins identified on the surface. Besides, the anomaly of chargeability of 25-35 mV / V is noticeable from 50 meters and persists up to 500 meters deep. However, in Yahualja area, geophysical prospecting was carried out towards the east and north sector. The low magnetic and a small anomaly in chargeability, identified 500m in depth, would be related to Apacheta and Minasjata veins. (Figure 4.)



**Figure 3.** Types of mineralization in Yahualja Target.



**Figure 4.** Chargeability anomaly in Aysacocha-Huamansallca Target at a depth of 200 m.

## Location and access

It has an area of 8,700 hectares and an average height of 4100 m.a.s.l. It is located 110 km northeast of the city of Trujillo, in the Western Cordillera, within the XXI Metallogenetic Belt "Miocene Au – Ag Ephitermals and polymetallic deposit with epithermal overprint" (Figure 1).

## PAMPA GRANDE HS Ephitermal Au – Porphyry Au prospect



Figure 1. Location of Pampa Grande. La Libertad

## Geological setting

Cretaceous (Goyllarisquizga Group) and Oligocene-Miocene volcanic rocks (Calipuy Group) are distributed in the area. The main structural control is Pallasca-Cordillera Blanca fault system, of NW-SE orientation. Related to this structural control, there are three parallel lineaments from north to south: Dos de Mayo-Barro Negro-Tambo (N50°W), Payhual-San Apolonio (N60°-50°W) and Otuzco-Quiruvilca-Tres Cruces (N60°-65°W).

## Alteration and mineralization

Two sectors of interest were located: San Apolonio and Ullapcham. In these places, complementary works of geology, geochemistry and geophysical prospecting were carried out.

## SAN APOLONIO SECTOR

- Local Geology

There is a sequence of volcanic rocks of porphyritic andesitic composition, lava flows, and andesitic sub-volcanic intrusions. Structurally, local faults of NE direction control the sector affected hydrothermally and in some cases, faults allow the exit of bodies of polymictic breccia.

- **Alteration and mineralization**

This sector presents hydrothermalism of the argillic type to incipient silicification. This is controlled by NE structures and stockwork with iron oxides veins (goethite-hematite) (Figure 2 a and b).



**Figure 2.** Iron networks with argillic alteration can be seen in both views.

Local faults and an active magmatic chamber resulted in the generation of bodies of polymictic breccia, with very rounded quartzite clasts and volcanic rocks cemented by a matrix of oxides and ground volcanic material. Also, at the outer edges of the argillized sector, there is an incipient propylitic alteration with chlorite, epidote and high magnetite content. This affects the host rock.

The mineralization is basically related to jarosite, goethite limonites, product of the leaching of pre-existing sulfides such as pyrite, magnetite. From the results of the samples, we interpret a high sulphidation epithermal deposit with moderate silicification and low precious metal content, except some volatile elements such as mercury between 2 and 17 ppm and zinc greater than 100 ppm.

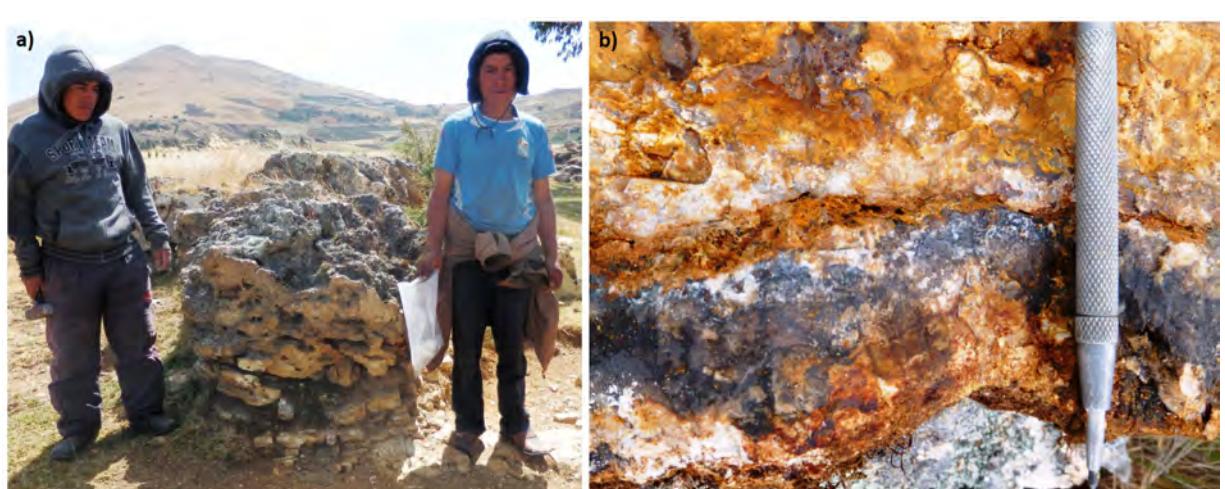
- ULLAPCHAN SECTOR

- Local Geology

Volcanoclastic rocks (volcanic breccia) form the sector. Composition varies andesitic to tuff rocks, intruded by porphyritic andesitic subvolcanic bodies. The pyroclastics rocks were hydrothermally altered by rich silica fluids, which generated a silica cap (Lithocap).

- Alteration and mineralization

Intense silicification (Lithocap) and / or silica sinter from chalcedony to opal is shown (Figure 3). The fluids took advantage of the permeability of the volcaniclastic rocks in order to be placed. Subvolcanic intrusives show pervasive silicification, with dissemination of pyrite. At the margins, the rocks show weak propilitization with chlorite and disseminated magnetite.



**Figure 3.** a) Detail of siliceous lithocap in Ullapcham. b) Banded texture with veinlets and oxide stains.

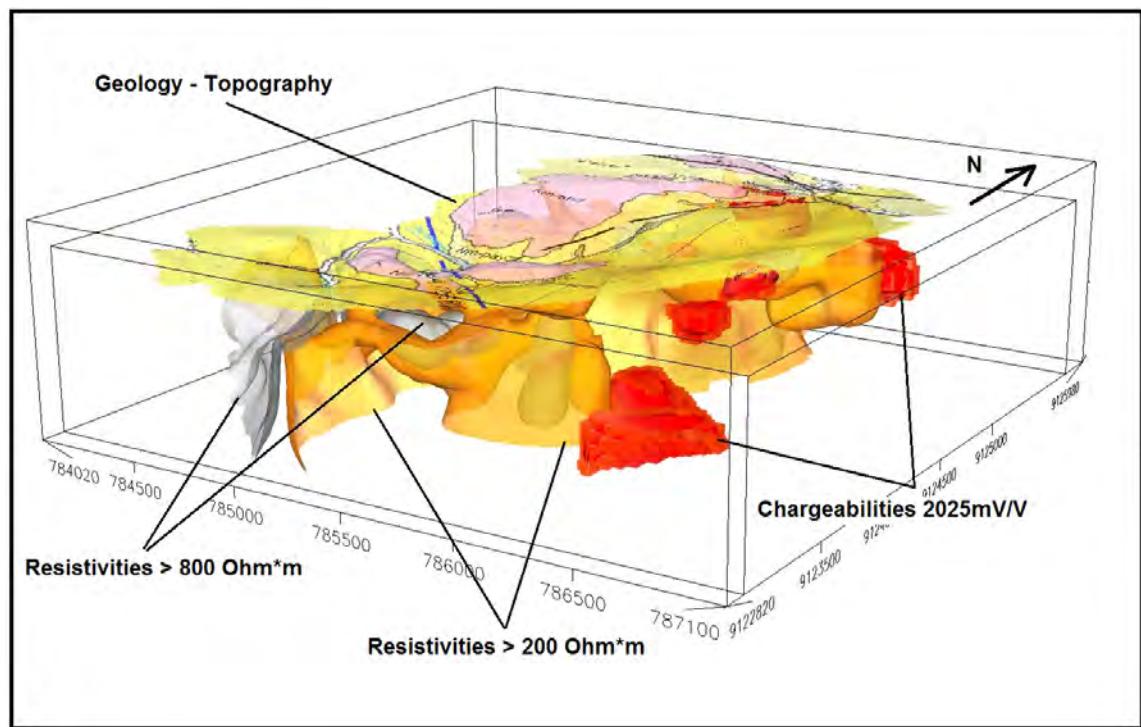
There is presence of sulphides in the silica layer, such as disseminated pyrite and leaching process in the veinlets. Magnetite is found throughout the volcanoclastic sequence. The results for the samples have anomalous values for arsenic (> 100 ppm) and molybdenum (>25 ppm).

### Geophysical Prospecting

The geophysical prospecting studies, allowed delimiting areas with high resistivity at shallow depth. This would be related to the sequences of porphyritic andesitic lavas with irregular veinlets of silica with oxides.

In addition, it has been interpreted argillic alteration to intermediate argillic in surface, which in depth passes to a weak to moderate silicification. There is an increase in chargeability values below this resistive horizon. They are considered as low, and that correlate with a geological level. The highest concentration of polarizable material seems to be located to the southeast, in an area of low and high resistivity.

In San Apolonio prospect, an anomaly has been delimited. It is interpreted as a possible body with dissemination of sulfides porphyry type and / or a subvolcanic at a depth of 400m. For detected chargeabilities of 25-30mV/V, the depth and dimensions of the anomaly become of little interest (Figure 4).



**Figure 4.** Views of the 3D Model of Chargeability Inversion - Resistivity with geology, San Apolonio Sector.



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