METALLOGENIC MAP OF PERU: MINING OPERATIONS AND PROJECTS

PERÚ Ministerio de Energía y Minas

SECTOR ENERGÍA Y MINAS
INGEMMET
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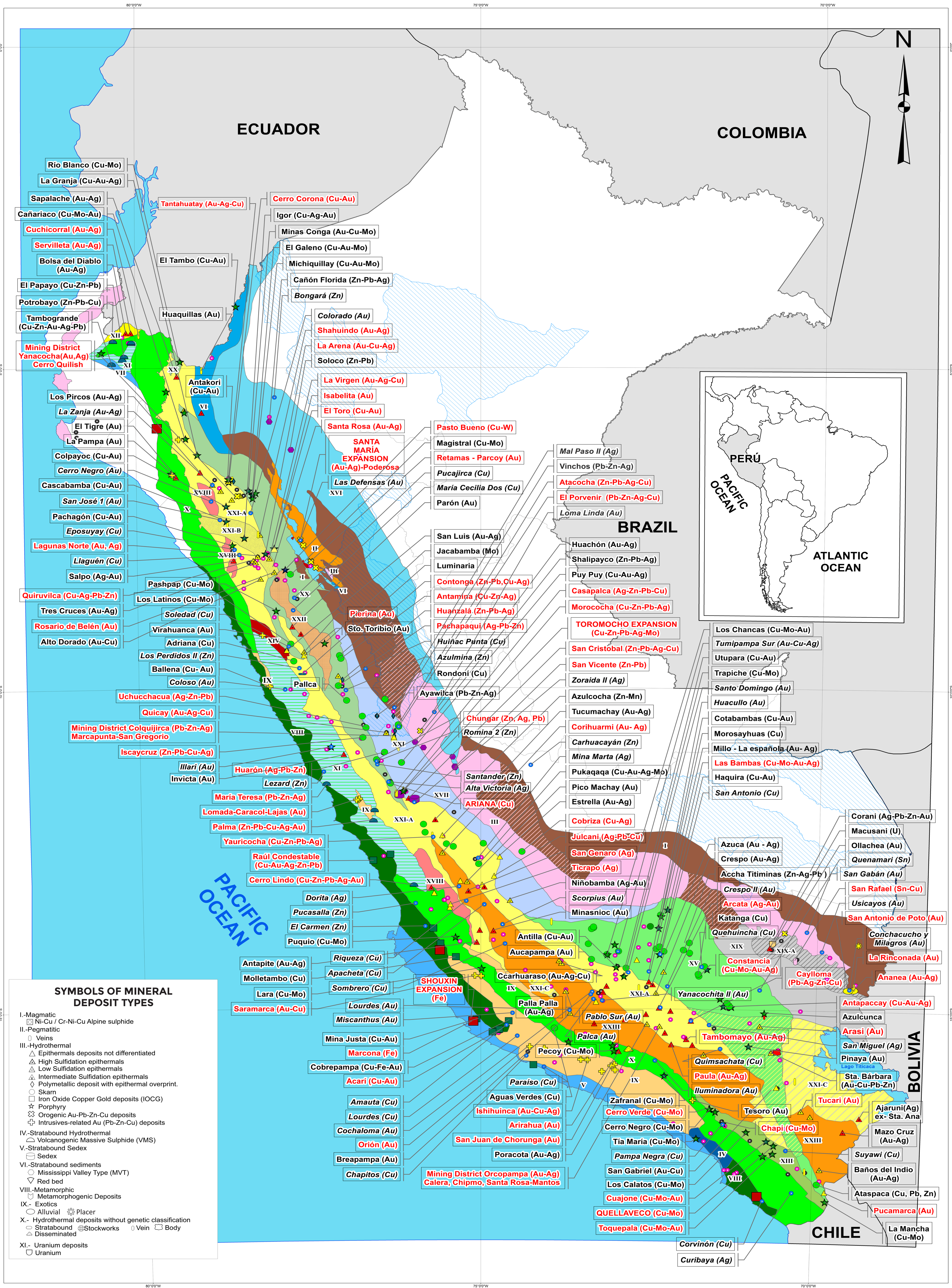

SYMBOLS OF MINERAL DEPOSIT TYPES

- I.-Magmatic
  - Ni-Cu / Cr-Ni-Cu Alpine sulphide
- II.-Pegmatitic
  - Veins
- III.-Hydrothermal
  - Epithermals deposits not differentiated
  - High Sulfidation epithermals
  - Low Sulfidation epithermals
  - Intermediate Sulfidation epithermals
  - Polymetallic deposit with epithermal overprint.
  - Skarn
  - Iron Oxide Copper Gold deposits (IOCG)
  - Porphyry
  - Orogenic Au-Pb-Zn-Cu deposits
  - Intrusives-related Au (Pb-Zn-Cu) deposits
- IV.-Stratabound Hydrothermal
  - Volcanogenic Massive Sulphide (VMS)
- V.-Stratabound Sedex
  - Sedex
- VI.-Stratabound sediments
  - Mississippi Valley Type (MVT)
  - Red bed
- VIII.-Metamorphic
  - Metamorphogenic Deposits
- IX.- Exotics
  - Alluvial
  - Placer
- X.- Hydrothermal deposits without genetic classification
  - Stratabound, Stockworks, Vein, Body, Disseminated
- XI.- Uranium deposits
  - Uranium

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DESCRIPTIVE MEMORY OF THE METALLOGENIC MAP OF PERU

I. Au deposits in Ordovician and Silurian-Devonian meta-sedimentary rocks

It is located along the Eastern Cordillera Range of Peru. Host rocks area composed of slate and schist from the lower Paleozoic. Ore structures are composed of quartz-gold veinlets and lenticular layers mainly controlled by NW-SE thrust faults. Ananea, La Rinconada, Capac, Orcco, and Untuca are among the main deposits.

II. Carboniferous-Permian orogenic Au-Pb-Zn-Cu deposits

It is located in the Eastern Cordillera in northern Peru. The mineralization is associated to the Pataz Batholith, which intrudes Lower Paleozoic metamorphic rocks. The mineralized structures show the geometry of veins and mantles, located in NW-SE shear zones. La Poderosa, Horizonte, Retamas, and Parcoy deposits are well known in this belt. Mineralization ages are between 315 and 286 My.

III. Li- U-W-Sn-Mo, Au-Cu-P b-Zn deposits related to Permian Triassic Cu-Ag intrusives and porphyry skarn

It has a NW-SE direction and is controlled by Satipo-Pangoa-San Francisco and Cerro de Pasco-Ayacucho fault systems. The mineralization is hosted in shales and limestones of the Carboniferous, with mantle and vein geometries. The most representative deposits in this belt are Cobriza and Huachon, associated to granitoids with ages between 270 and 255 My.In the Puno Altiplano and within the NW-SE faults domain of the Urcos-Sicuani-Ayaviri system, the W-Au deposit San Judas Tadeo is found isolated with an estimated mineralization age of 255.5 My. (Clark et al, 1990). Evidence of uranium and lithium mineralization is found in the intrusive rocks of the PermoTriassic, Tectonostratigraphic Unit: Arc Magmatic Plutonism. Permotriassic (PET-pAM) (Quispe L. et. al., 2020); delimited by the fault systems of Cerro de Pasco-Ayacucho and Oxapampa - San Vicente.

IV. Middle Jurassic Porphyry Cu-Mo

This bell is structurally controlled by the Ica-Islay-Ilo NW-SE faults system and minor faults NE-SW and N-S trending (Acosta et al., 2008). Tia Maria and La Llave are the most important deposits and mineralization age are between 155 and 166 My.

V. Upper-middle Jurassic Cu-Fe-Au (IOCG) deposits

Its main structural control is the Ica-Islay-Ilo NW-SE fault system, which constitutes the corridor of the same name (Acosta et al., 2008). The largest deposits of this belt are Marcona, Mina Justa and Rosa María, with ages of mineralization between 165 and 160 My.

VI. Upper Jurassic porphyry and Cu-Au skarns

It extends along the northeast of Peru, within the tectonic Olmos-Loja domain and it is limited by regional N-S faults, mainly thrust faults. The Cu-Au mineralization is related to intrusive stocks from upper Jurassic, with ages around 153 My. The most well-known deposits are found in Ecuador, which are Nambija, Napintza, Cumay, Guaysini and Frutos del Norte. El Tambo, Huaquillas and Hualatan projects are located in national territory.

VII. Upper Jurassic- Albian volcanogenic massive sulphides Cu-Zn-Au deposits

It is located on the northeast of Peru, in the South west sector of the Lancones basin, in a rift context (Tegart et al, 2000, Ríos 2004; Rodríguez et al, 2008). Mineralization is related to magmatic dacitic activity. The main structural regional controls are NNE-SSW and WNW-ESE faults. Tambo grande is the main deposit, with two mineralization ages of 165 ± 17 (Re/Os, pirite, Ryan Mathur; in Rios, 2004) and 104 ± 2 My. (U/Pb, Winter et al., 2002).

VIII. Lower Cretaceous Cu-Fe-Au (IOGG) deposits

This belt is divided into two parts. Trujillo-Mala-Paracas-Ocoña, and Locumba-Sama. Between Trujillo and Ocoña (8°-15°-30') the main mineralization controls are the NW-SE faults of the Casma basin, in the Trujillo-Mala-Paracas sector (~112 and 100 M.y.) and volcanic Chocolate Formation in the Paracas Nazca sector (~115 and 112 M.y). The main deposits in this segment are: Tanguche, Raul-Condestable , Monterrosas, Eliana, Acarí, and others. Between Locumba and Sama (17°-18°), IOGG deposits are related to magmatic activity of ~124 My., in addition to intrusions of gabbros and monzodiorites of ages ~112 My. Its structural controls are defined by the extension of the NW-SE Ica-Islay-Ilo system and NE-SW minor faults. The most important deposits in this segment are Licona and Hierro Morrito. In general, the mineralization events that constitute this belt are recorded between 115 and 100 My. (Acosta et al. 2008).

IX. Upper Cretaceous instrusion – related to Au – Pb – Zn – Cu deposits

It extends discontinuously in four areas: Huarmey (9°30'-10°), Canta (11°-11°30'), Huancavelica - Ayacucho sector (14°-15°) Saramarca-Nazca-Ocoña (14°30'-17th). The mineralized structures bear quartz-gold-sulphides and are hosted in Upper Cretaceous granites of the Coastal Batholith. In Huarmey and Canta the structural controls are the NW-SE, N-S, and NE-SW secondary faults of the NW-SE Conchao-Cocachacra and Tapacocha regional fault systems. The deposit that stands out in Huarmey is Cerro Ballena and in Canta the Lomada, Caracol and Lajas deposits. In the Huancavelica - Ayacucho sector, the veins are controlled by the Cincha-Lluta fault system and there are the El Encanto, Zorro Plateado, Jatun Pata, and Melchorita deposits, and others. Further south, in Saramarca-Nazca-Ocoña, the mineralized structures are controlled by faults with NW-SE, N-S and E-W orientations, which constitute the Nazca-Ocoña corridor (Acosta et al. 2008). Among the main deposits in this southern area are they can mention Orión, Caravelí, Ishihuinca, Calpa, Arirahua and San Juan de Chorunga.

X. Upper Cretaceous Porphyry Cu -Mo

It extends discontinuously from Lancones basin to the south of Peru. In Lancones basin deposits are controlled by NE-SW trending faults. The mineralization are related to Late Cretaceous granitoids (~75 M.y.). The main deposits are Horquetas, Curi-Lagartos, Chancadora, Cascajo Blanco and others. Likewise, within the Lancones basin, some Fe skarnoids can be identified, located in the contact between these intrusives and the shims of the Albian Cenomanian La Bocana Formation. In central and southern Peru the mineralization is related to Upper Cretaceous granitic intrusives of the Coastal Batholith and controlled by NW-SE Conchao-Cocachacra, Cincha-Lluta and Incapuquio faults systems and as well as N-S trending minor faults (Acosta et al., 2008). The important deposits of this sector include Marcahui, Durazno, Puquio, Cuco, Aguas Verdes, Lara, Tibillos, Zafranal and Angostura. Their ages of mineralization are ranged from 80 to 68 My.

XI. Upper Cretaceous - Paleocene Volcanogenic Massive Sulphide Pb- Zn -Cu deposits

It consists of two sub- provinces, the first one in the central part of the Lancones basin in northwestern Peru, and the second on the west flank of the Western Cordillera Range between La Libertad and Ica (9°-13°). In Lancones Basin these deposits are hosted in felsic calc-alkaline volcanic rocks (Rios, 2004) of volcano sedimentary sequences age Albian - Cenomanian. In this sector are recognized deposits as El Papayo, Cerro Colorado and Potrobayo whose structural controls are minor faults with NE- SW, E-W and NNE- SSW trending, that make up the deformation zone of deflection Huancabamba are known. Between La Libertad and Ica , Romero (2007) difference - Paleocene Cretaceous calc-alkaline volcanic sequences, previously attributed as Casma Group, but now called Maastrichtian-Danian basin, type margins back arc basin (Romero et al., 2008). This basin hosts type volcanogenic massive sulphide Pb -Zn -Cu deposits (kuroko type), whose regional controls on mineralization are NW-SE faults belong the Tapacocha-Conchao- Cocachacra system. Where Maria Teresa, Aurora Augusta, Leonila - Graciela (Perubar), Cerro Lindo, Palmas and Balducho are the most relevant deposits. The mineralization ages are ranged from 68 to 62 My.

XII. Upper Cretaceous -Paleocene Au-Ag epithermals deposits

It is located in the central sector of the Lancones basin, northern Peru. The mineralized structures are quartz-gold veins, towards NE-SW direction and hosted by Albian-Cenomanian volcanic rocks. The Au-Ag deposits are associated with the Upper Cretaceous -Paleocene granitoids of the area (Injoque et al, 2000; Rios, 2004). Among the most representative deposits are Bolsa del Diablo, Potrero, Suyo, and Pilares.

XIII. Cu-Mo porphyry and Paleocene-Eocene intrusives-related to polymetallic deposits

It extends in the west flank of the Western Cordillera of southern Peru and clusters are the largest tonnage Cu-Mo deposits of the area. The Intrusive related mineralization present dioritic, granodioritic and monzonitic compositions, whose emplacements are controlled by the NW-SE Incapuquio faults system. This belt records two metallogenic epochs with Cu-Mo mineralization (Acosta et al., 2008). The first ones are represented by Cerro Verde and Toquepala deposits during the Paleocene epoch (62 to 55 My). The second is the Eocene (54 to 52 My.), characterized by deposits as Cuajone and Quellaveco. Distal porphyry Cu-Mo systems in the sedimentary sequences are presented the ore structures Cu-Pb-Zn vein and bodies geometries, similar to Ataspaca.

XIV. Eocene intrusives-related to Au-Cu-Pb-Zn deposits

It is located to the north in the Ancash region (9° - 10°). The mineralized structures are formed by quartz-gold-sulphide veins N-S, E-W, and NW-SE trends. Veins are related to Eocene tonalite and granodiorite stocks, emplaced in the western limit of the Cenozoic volcanic domain of the Western Cordillera Range and the Coastal Batholith. The main structural control is the Conchao-Cocachacra fault system, in the northern part of this belt where the main deposits are La Cantera, Virahuanca, Tres Minas and Chuncas.

XV. Cu-Mo (Au, Zn) porphyry-skarns belt and Cu-Au-Fe deposits related to Eocene-Oligocene intrusives

This is located between the Western Cordillera Range and the High Plateau of the regions of Ayacucho, Apurimac, Cusco, and Puno. The mineralization are associated with dioritic to granodioritic granitoids that belong to Eocene–Oligocene Batholith Andahuaylas-Yauri under transpressional conditions (Carlotto, 1999 and Perello et al, 2003) and controlled by Urcos-Sicuani-Ayaviri, Cusco-Lagunillas-Mañazo, Abancay-Andahuaylas-Totos- Chinchero-Licapa and Abancay-Condorama-Caylloma faults systems. Intermediate to acid intrusive are associated with Cu-Mo (Au) mineralization and the contact with carbonate sequences Albian-Turonian developed skarn bodies Cu- Zn. The mafic intrusives are related to Fe- Cu-Au mineralization, presented as bodies in contact with Turonian-Albian carbonate sequences and Au-Cu veins in the intrusive.

The main deposits are Tintaya, Katanga, Las Bambas, Cotabambas, Morosayhuas, Antapacay, Haquira, Los Chancas, Antilla, Trapiche, , and others. The ages of mineralization are recorded from 42 to 30 My. Locally in this belt there is copper mineralization "Red Bed" type, hosted in San Jerónimo Group red beds (Loza, 2004) as Tambomachay, Ushpa, Tipon and Anta deposits.

XVI. Eocene – Miocene Mississippi Valley Type Pb Zn deposits

It is located along the Sub-Andean zone of central and northern Peru. The Pb-Zn mineralization are hosted in the Upper Triassic to Lower Jurassic dolostones rocks sequences of Pucara Group. This belt is controlled by Satipo – Pangoa-San Francisco fault system, NW-SE- trending, and thrusts faults put the Eastern Cordillera in contact with the Sub Andean Zone. In this area is placed the following deposits: San Vicente, Piñon, Sillapata Huancrash-Aynamayo, Puntayacu, Pichita Caluga, Cascas, Ninabamba, Raymondi Sur, Tambo María, Pampa Seca, San Roque, Bolívar, Soloco y Bongará. It is also possible to find MVT deposits of Pb-Zn, but unlike the main belt, these deposits are distributed punctually in closed anticlines that disappear under younger rocks, in this sector is placed the Ulcumayo and Shalipayco deposits.

XVII. Eocene epithermal Au-Ag belt and Eocene-Oligocene-Miocene polymetallic deposits

It is located in the Western Cordillera of central Peru (9º-14º). This belt is characterized by being one of the most complex, due to the fact that metallic deposits of several types, such as Cu-Mo porphyries, Pb-Zn-Cu skarns, epithermal Au-Ag and polymetallic Pb-Zn (Ag) related to intrusions. These deposits are related to three magmatic events, recorded in the periods 39-33 M.y. (Eocene), 31-25 My. (Oligocene) and 20-10 My. (Miocene). The spatial and temporal distribution of these deposits is controlled by the reactivations of the NW-SE and N-S faults of the La Oroya-Huancavelica and Cerro de Pasco-Ayacucho systems. The oldest deposit known to date is the epithermal Au-Ag de Quicay, with an age of mineralization in the range of 37 and 35 My. (Noble and McKee, 1999). Quicay is related to the magmatic activity of the Oligocene, manifested mainly by the emplacement of intrusive bodies of variable compositions between diorites and granodiorites. There are also porphyry-type deposits of Cu-Mo, such as Pariajirca and Pb-Zn-Cu skarns, in contact with Upper Triassic-Lower Jurassic carbonate sequences of the Pucara Group, is the case of the El Porvenir (Milpo), Atacocha, Raulito, Rondoní, Patashmina and Huancamina, as well as the Vinchos porphyry-skarn. Likewise, the Oligocene intrusions are related with veins of Pb-Zn-Cu, such as Machcán and others. According to the K/Ar radiometric age reports of Soler and Bonhome (1988), the metallogenic age for the deposits of Pb-Zn-Cu would be found between 29 and 26 My. On the other hand, Miocene intrusions ~20 My. are associated with Pb-Zn-Cu mineralizations, as is the case of the Anita deposits, Asunción, Chanchamina and others from central Peru.

XVIII. Oligocene Au-Ag epithermal deposits

This belt is sub-divided into two segments. To the north, the Otuzco-San Pablo-Porculla segment (7°-8°30'), and to the South, the Huaytará-Tantará-Tupe segment (12°30'14°30'). The mineralization is controlled by NW-SE and E-W faults. To the north, the following deposits are found: Salpo, San Pedro, Paredones, Coshuro, Lucero, Los Pircos, Mishahuanca and others. Some of them are related to volcanic centers, such as Uromalqui (Salpo) San Pedro and Urillao-Ruhos (Rivera et al., 2004). To the South the main deposits are Antapite, Pampa Andino and Ticrapo. In both segments, the mineralized structures exhibit vein geometries with Au-Ag low sulphidation epithermal-type content (Quispe, 2006; Acosta & Santisteban 2007; Acosta et al., 2008). The mineralization ages are estimated between 31 and 25 My.

XIX. Oligocene Miocene intrusive -related Sn – Cu – W deposits and Ag - Pb – Zn (Au) epithermal

It is located at the southwestern end of the Eastern Cordillera and in the Putina basin, in southern Peru. It is bounded by the NW-SE Urcos-Sicuani-Ayaviri fault system and the faults that control the western sector of the Putina basin. The Sn-Cu-W mineralization is related to "S-type" peraluminous stocks, which vary from monzogranites to granodiorites (Kontak and Clark, 2002), with strong chloritic alteration (Mlynarczyk et al., 2003). These intrusive rocks extended to Cordillera Real in Bolivia with emplacement age of Oligocene to Miocene cutting Ordovician slates, schists and quartzites. The main deposit in Peru is San Rafael, but includes other smalls as Palca 11 and Santo Domingo. The mineralization age is between 25 and 22 My., but towards the Bolivian side, in the Cerro Rico deposit recorded the youngest age, 14 My. (Zartman and Cunningham, 1995). Also, associated with volcanic events of 25 ~14 My., there are Ag -Pb- Zn (Au) intermediate to low sulphidation epithermals deposits and Sb ore veins, where Corani is the most important ore deposit.

XIX-A. U–Li and epithermal deposits associated with Mio-Pliocene Backarc Magmatism

This sub-belt includes the Crucero and Macusani basins (Laubacher et al., 1988a) where the volcanic centers of Macusani, Picotani and Cayconi are found (Rivera et al., 2011); It is limited to the east by the Cordillera Real fault system and to the west by the Tectonostratigraphic Unit: Permotriassic Magmatic Arc Plutonism (PET-pAM) and the Paleozoic basement. The U-Li mineralization is located in the Miopliocene back-arc volcanics (Quispe-Rentería, L. et al., 2020a), Tectonostratigraphic Unit made up of the Quenamari formations (Chacacuniza, Sapanuta and Yapamayo members), Picotani and Cayconi. They are made up of “type S” peraluminous volcanic rocks. The most representative deposit is the Macusani mine, located in the caldera of the same name with ores of autunite, metautunite, coffinite, weeksite, carnotite and uraninite. Mineralization occurs in stockwork-type veinlets. Mineralization ages range from Lower Miocene to Pliocene (23-4 M.y.), Barnes et al., 1970; Fleischer & Price, 1964; Kontak et al., 1985; Pichavant et al., (1987) Kontak (1985, in Pichavant et al., 1988a), by Bonhomme et al. (1988) and Laubacher et al. (1988). (Cheilletz et al.,1992), Laubacher et al., (1988a).

XX. Cu-Mo (Au) Porphyry, Pb-Zn-Cu (Ag) skarns and polymetallic deposits related to Mioceno intrusions

It is located in the Western Cordillera of the north and central Peru (5°-12°). This belt is controlled by the NW-SE thrust and fault system of the Chonta and Punre-Canchis-Magistral systems, the last one conforms to the Marañon fold and thrust belt (MTFB). In northern Peru, the faults strike change from WNW-ESE to N-S when they are near to Huancabamba deflection. This belt shows three magmatic events related to the mineralization: 22-20 My., 28-13 My. and 10-5 My. Magmatic events are evidenced by the emplacement of calc-alkaline diorite granodiorite intrusive stocks. The first 22-20 My. event is associated with Michiquillay and Aurora Patricia Cu-Mo porphyry-type deposits. The second event of 18-13 My. contains Cu-Mo and Cu-Au porphyry-type mineralization which sometimes develops skarns and Pb-Zn-Ag replacement bodies when is in contact with carbonate rocks of the Cretaceous, such as Chungar, Iscaycruz, and other deposits. The Cu-Mo deposits (18-13 My) are related to intermediate to acid intrusions, such as El Galeno, La Granja, Cañariaco, Paron and Magistral. Whereas the Cu-Au porphyries are associated with basic to intermediate intrusions, as it is the case of Minas Conga (El Perol and Chaihualgón), and Cerro Corona.

Other porphyry systems similar to the previous ones are punctually shown in sectors where volcanic Miocene domain (belt XXI) have been erosioned, thus we can mention the Chamis, Colpayoc, Cascabamba, San José, La Arena, Alto Dorado, Pashpap, Los Latinos deposits, as well as the porphyry-epithermal transition deposit El Toro, and the Pb-Zn-Cu skarn deposit El Extraño. The third magmatic 10-5 event generates Cu-Mo (Au) porphyry-type deposits, such as Rio Blanco, in the North; Toromocho and Puy Puy in the center. The 15-5 My. intrusive controlled by the domain of the system faults Chonta, Churín-San Mateo and the MTFB in contact with Cretaceous calcareous rocks (9°-12°30') exhibit skarns and Cu-Zn and Pb-Zn-Ag replacement bodies, such as Antamina, Huanzala, Pahapaqui, Raura, Ucchuchacua, Huarón , Yauricocha, and others. They also generate veins and Pb-Zn-Ag replacement bodies, similar to Yauliyacu-Casapalca, Morococha, Mina Solitaria, and San Cristobal; this last one with ~6 My. (Noble & McKee, 1999).

XXI. Au-Ag epithermal Miocene deposits

XXI-A. Au-Ag epithermal deposits hosted in volcanic rocks

In the North (5°-9°30'), it controlled by NW-SE faults that change to WNW-ESE trend when getting closer to the Cajamarca deflection, and then N-S when getting closer to the Huancabamba deflection. In the center-north sector (10°-13° 30'), its main controls are Conchao-Cocachacra and Chonta NW-SE fault system, Cerro de Pasco-Ayacucho and La Oroya-Huancavalica N-S fault system, and Abancay-Andahuaylas-Totos-Chinchoraos-Licapa E-W fault system.

The southern sector of this belt is controlled by Cincha-Lluta, Incapuquio, Abancay-Condoroma-Caylloma and Cusco-Lagunillas-Mañazo NW-SE faults systems. This belt assembles high, low and intermediate sulphidation epithermals Au-Ag (Pb-Zn-Cu) deposits. According to their mineralization ages, they can be sub-divided into two metallogenic epochs of 18-13 My. and 12-8 My. Quiruvilca, Pierina, Tamboraque, and Santa Rita are among the deposits hosted in volcanic rocks. Some deposits are related to volcanic centers, such as Quequenda (Alto Chicama), Quiruvilca, Alto Dorado, Matala, Macón and Alto Cruz-Ticas (Rivera et al., 2005).

Au-Ag deposits of high sulphidation are located to the South such as Chipmo (Orcopampa), Poracota and possibly Arasi. Additionally, there are low sulphidation Au-Ag (Pb-Zn) epithermals, similar to Calera, Caylloma and Selene. In the metalogenic epoch of 12-8 My. , in northern Peru there are Au-Ag deposits of Yanacocha, Tantahuatay, and La Zanja mining districts, as well as veins and Pb-Zn-Cu (Ag, Au) replacement bodies. In central Peru, the second Pb-Zn (Ag) mineralization pulse is located in Cerro de Pasco (12.4-10.9 My. Baugartner et al., 2006) and mineralization of the Colquijirca district (the first mineralization pulse corresponds to an epithermal overprint event). Between 12° and 13°30' latitude, in the NW-SE faults of La Oroya-Huancavelica system domain, the presence of Au-Ag epithermals in carbonate rocks of the Triassic-Jurassic of the Pucara Group stands out, such as Tucumachay. While in the influence of the NW-SE faults of the Chonta system and of the Huancayo-Julcani N-S fault there are Pb-Zn-Ag high and intermediate sulphidation epithermals such as Julcani, Palomo, San Genaro, Huachocolpa, Caudalosa Grande, Caudalosa Chica, and others. Far to South (14°-16°) there are manly low sulphidation Au-Ag epithermals such as Ares, Shila, and Paula.

XXI-B. Au and Ag epithermal deposits hosted in sedimentary rocks

In northern Peru (~7°30´), there are high sulphidation epithermal deposits hosted in siliciclastic sequences of the Goyllarisquizga Lower Cretaceous with a mineralization age between 17 to 14 M.y. The most important deposits are Alto Chicama (Lagunas Norte), La Virgen, Santa Rosa, Rosario de Belén and Shahuindo.

XXI-C. Pb-Zn-Cu Polymetallic deposits with epithermal overprint

In central Peru (10°30'-11°), the N-W faults of the Cerro de Pasco-Ayacucho system, control the Pocobamba Eocene basin (Ángeles, 1999) and at the same time, this controls the volcanic centers of Cerro de Pasco and Colquijirca. Therefore, the first Pb-Zn-Ag with epithermal overprint pulse is developed in the Cerro de Pasco district between 18 and 13 M.y. (14.5-14.1 Ma, Baungartner et al, 2006).

In the South (14°30), the hosted rocks are formed by Miocene Tacaza Group and the mineralization corresponds to Pb-Ag-Cu, Pb-Cu-Ag and Cu-Pb-Ag veins. Main occurrences are Pepita, Carmencito, C° Huarajuy and Don Felipe. Further South, (16° and 17°S) the mineralization is found between two corridors formed by the Incapuquio, Condoroma-Caylloma and Cusco-Lagunillas-Mañaza fault systems. The hosting rocks belong to Tacaza Group, Maure Group, and limestones of Ayavacas Formation. The mineralization is Cu-Pb-Zn type and the most significant mineral deposits are Tacaza, Santa Barbara, Berenquela, Mina Los Rosales, Quello Quello and San Antonio de Esquilache. The mineralization age is associated with intrusive of ages between 22 and 19 My.

XXII. Upper Miocene intrusive-related to W-Mo-Cu deposits

Located in the Western Cordillera (8 ° -10 °) from the north-central of Peru. The Cu-W mineralization are associated with granitoids from the Cordillera Blanca whose place are controlled by the NW-SE and NS trending of Cordillera Blanca faults systems. The most representative deposits are Pasto Bueno, Mundo Nuevo, Nueva California, Lacabamba y Señor de la Soledad. The mineralized structures are vein geometries with variable contents of quartz-copper hubnerite - ferberite gray. The ages of mineralization is recorded between 9 and 6 My.

XXIII. Mio-Pliocene Au-Ag epithermal deposits

It extends along with the volcanic domain of the Western Cordillera of central-Southern of Peru (12° 30-18°). The Au-Ag mineralization is related to Mio-Pliocene magmatic activity. Its structural controls are NW-SE faults of the Chonta, Abancay-Conedoroma-Caylloma and Cincha-Lluta faults systems, as well as minor E-W faults. The mineralization ages of this belt are registered between 7 and 1 My. , formed mainly by Au-Ag high sulphidation epithermals, with exception to the Ag-Au Arcata deposit (5.4 My., Candiotti et al, 1990) and the intermediate sulphidation Pb-Zn-Ag deposit (6.4 My., Noble & McKee, 1999). The Au-Ag high sulphidation epithermals that are distributed in this belt are Tucari, Santa Rosa, Pucamarca, Pico Machay, Corihuarmi, Huamaranzo, Ccarhuaraso, Palla Palla, Baños del Indio and others (Quispe, 2004; Acosta & Santisteban, 2007; Acosta et al., 2008).

Favorable hydrographic basins for placer and alluvial type Au deposits

These basins extend mainly in the Amazonian plain and in part of the Eastern Cordillera. The most important are Madre de Dios, Alto Huallaga and Santiago-Bajo.

METALLOGENIC BELTS

- XXIII – Mio-Pliocene Au-Ag epithermal deposits
- XXII – Upper Miocene intrusive-related W-Mo-Cu deposits
- XXI – Miocene Au-Ag epithermal
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- XXI-B – Au and Ag epithermal deposits hosted in sedimentary rocks
- XXI-C – P- b-Zn-Cu Polymetallic deposits with epithermal Au-Ag overlay
- XX – Miocene Porphyry Cu-Mo (Au), skarns Pb-Zn-Cu (Ag), and polymetallic intrusion related deposits
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- XIXA – U–Li and epithermal deposits associated with Mio-Pliocene Backarc Magmatism
- XVIII – Oligocene Au-Ag epithermals
- XVII – Eocene epithermal Au-Ag belt and Eocene-Oligocene-Miocene polymetallic deposits
- XVI – Eocene – Miocene Mississippi Valley Type Pb Zn deposits
- XV – Cu-Mo (Au, Zn) porphyry-skarns and Cu-Au-Fe deposits belt related to Eocene-Oligocene intrusives
- XIV – Eocene intrusives-related Au-Cu-Pb-Zn deposits
- XIII – Cu-Mo porphyry and Paleocene-Eocene intrusives-related polymetallic deposits
- XII – Late Cretaceous -Paleocene Au-Ag epithermals
- XI – Upper Cretaceous - Paleocene Volcanogenic Massive Sulfide Pb- Zn -Cu deposits
- X – Upper Cretaceous Porphyry Cu -Mo
- IX – Au-Pb-Zn-Cu deposits belt related to Late Cretaceous intrusives
- VIII – Lower Cretaceous Cu-Fe-Au (IOCG) deposits
- VII – Late Jurassic- Albian volcanogenic massive sulfides Cu-Zn-Au deposits
- VI – Late Jurassic porphyry and skarns Cu-Au
- V – Late-middle Jurassic Cu-Fe-Au (IOCG) deposits
- IV – Middle Jurassic Porphyry Cu -Mo
- III – Li- U-W-Sn-Mo, Au-Cu-P b-Zn deposits related to Permian Triassic Cu-Ag intrusives and porphyry skarn
- II – Carboniferous-Permian orogenic Au-Pb-Zn-Cu deposits
- I – Au deposits in Ordovician and Silurian-Devonian meta-sedimentary rocks

METALS

- Au-Pb-Zn
- Ag-Pb-Zn
- Cu-Au-Fe
- Cu-Mo-Au
- Cu-Pb-Zn
- Cu-Zn-Ag
- Cu-W-Zn
- Cu-Ag-Au
- Zn-Pb-Ag
- Zn-Cu-Au
- Pb-Ag-Zn
- Pb-Zn-Ag
- Pb-Cu-Zn
- Fe
- Zn-Fe
- Sn-Cu
- Sb-Ag-Au
- Mg
- U

SYMBOLS

- Watershed favorable for gold in placer deposits
- Operation / Project – Mining unit status
- Operation – Mines under construction (source:Projects Portfolio MINEM 2022)
- Project – Exploration Projects (source:Projects Portfolio MINEM 2022)
- Mining Projects Portfolio - MINEM 2022
- Project not defined by deposit type
- Prospects