continent, and the supergene or post-exhumation stage (TABLE 1). Primordial concentrations form prior to the obduction of the ophiolite, and include well known VMS deposits (Cyprus, Cu-Zn or mafic type, usually Au bearing), and also potential magmatic concentrations (usually related to sulfides in ultramafites or gabbros), as well as possible concentrations related to recently defined sub-sea processes (types 1.3, 1.4). Exotic concentrations form by processes occurring as or after the ophiolite is stacked onto the continental crust, usually in a cordilleran or collisional belt environment: the metamorphic (listwaenites, birbirites), orogenic, and epithermal types are presently productive. Supergene processes can produce gold-rich gossan bodies, as well as laterite and placer concentrations.TABLE 1.- Typology of potential gold concentrations in ophiolitesGroup: 1.- Primordial concentrations 2.- Exotic concentrations 3.- Supergene concentrationsStage: (1)Sub-oceanic(ocean-floor or intra-litohspheric), pre-obduction -(2)Continental(formed in the continental crust), sin-post obduction-(3)Supergene(due to weathering / erosion after exhumation)Types: 1.1.- Magmatic; 1.2.- In VMS deps./ Stw.*;1.3.- Porphyry related;1.4.- Epithermal;1.5.- Other -- 2.1.- Metamorphic*;2.2.- Orogenic*;2.3.- Intrusion related;2.4.- Epithermal *;2.5.- Other--3.1.- Ox. Zone / gossan*;3.2.- Lateritic; 3.3.- Detrital. Explanation: (*) Presently active mines known (Cyprus, Turkey, Russia, Morocco, Canada, USA, Oman, a.o.).VMS = Volcanogenic Massive Sulphide Deposits. Stw = Stockwork or feeder zone to VMS dep.

8-12 Oral Zhang, Xingchun

A PRELIMINARY STUDY OF THE LOCATION AND DISTRIBUTION OF GOLD IN THE SHUIYINDONG GOLD DEPOSIT, GUIZHOU, CHINA

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Keywords: Shuiyingdong; location and distribution of gold; sediment-hosted gold deposit; Guizhou China

The Shuiyindong sediment-hosted disseminated gold deposit is located in the Zhenfen County, Guizhou Province. It lies on the eastern part of the Huijiabao anticline of the southwestern edge of the Yangtze paraplatform. Gold mineralization occurs mainly in the silicified and dolomitized bioclastic limestone and marl (85%) and strongly silicified and brecciated siltstone (14%) of the Middle Permian Longtan Formation in forms of layers and lens along the bedding. Orebodies mainly distributed within the core part of about 300m to the axis of the Huijiabao anticline.The ore contains fine disseminated pyrite, relatively coarse pyrite along bedding, disseminated pyrite framboids, fine arsenopyrite needles, quartz, calcite and dolomite veins and patches, and local realgar, orpiment, cinnabar, stibnite veinlets and patches. Arsenopyrite occurs normally as needles with rhombus shape on section and is coexisted with pyrite grains. Mian wallrock alteration includes silicification, pyritization, arsenopyritization, carbonation, and alterations of realgar, cinnabar, and stibnite. The gold grade of the ore in the deposit is associated with the disseminated fine arsenian pyrite and arsenopyrite, but without any relationship to the coarse pyrite along the bedding or the disseminated pyrite framboids. No native gold particles have been observed under optical microscope and electron microprobe. High resolution EPMA was used to map pyrite and arsenopyrite grains for obtaining As, Au and Sb X-ray images respectively. The Au, As elemental distribution maps illustrate the correlation between these two elements in arsenian pyrite and arsenopyrite. The core of the zoned pyrite was formed early than the gold precipitation and gold is mainly located in hydrothermal arsenian pyrite and arsenopyrite. The gold probably occurs as sub-micron to nanometer sized particles heterogeneously disseminated in arsenian pyrite and arsenopyrite. The gold-bearing capability of the arsenopyrite should be paid attention because of its high gold concentration, though the content of arsenopyrite is less than that of pyrite in the ore of the Shuiyindong deposit.The use of bulk sulfur isotope data from the zoned pyrite grains to discuss the sulfur source would lead to some discrepancies for the arsenian pyrite actually associated with the gold mineralization.

8-13 Oral Pinto, Álvaro

GOLD MINERALIZATION AT THE NEVES CORVO ORE DEPOSIT, PORTUGAL

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Keywords: Gold; Neves Corvo; Iberian Pyrite Belt

Gold in the Neves Corvo ore bodies averages <1 ppm but has been found in higher concentrations locally in the Lombador and Neves-Norte ore bodies. Gold is associated with bismuth, arsenic, cobalt, copper, tin, indium, mercury, tellurium, selenium and antimony rich ores. Gold is also present in barren stockwork but here it has been found as sub-microscopic inclusions within the structure of arsenopyrite.Three generations of gold with different compositions can be distinguished. One generation is found as inclusions with galenobismutite (Pb Bi2 S4) and rezbanyite (Pb3 Cu2 Bi10 S19½) in arsenopyrite and cobaltite together with native bismuth. The second generation of gold is associated with chalcopyrite, silver-bearing (1%) tetrahedrite and galena forming veins, which have invaded fractured pyrite. The third generation of gold can only be found in the stockwork type with low contents in base metals. Gold occurs as submicroscopic inclusions in the structure of late arsenopyrite crystals. Gold occurring as inclusions in arsenic and cobalt minerals is interpreted as an early formed phase whereas the larger grains associated with chalcopyrite and tetrahedrite are the result of a later remobilisation of the first gold generation. The third gold generation lies within a late stage phase of ore formation at Neves Corvo. The origin of this gold may be related with a late stage of the hydrothermal system as proposed by Leistel et al. (1998) for the gold precipitation at the La Zarza stockwork in Southern Spain.Gold-rich polymetallic sulphides can be found forming today although the gold is generally fine-grained and commonly submicroscopic. These deposits typically include high copper concentrations and the formation of bornite together with higher than average levels of arsenic, antimony, lead and zinc and, in some examples, cadmium, mercury, thallium and gallium.Further geological, geochemical and mineralogical studies are needed to provide a better understanding of the processes and mechanisms involved in the transportation and precipitation of gold in the Neves-Corvo ore deposit.

8-14 Oral Gaeta Tassinari, Colombo Celso

AGE AND SOURCES OF GOLD MINERALIZATIONS FROM MARMATO MINING DISTRICT, NW COLOMBIA: NEW INSIGHTS INTO EXPLORATION PROGRAM FROM RADIOGENIC ISOTOPES STUDIES

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Keywords: ISOTOPE GEOLOGY; MARMATO DISTRICT; METALLOGENESIS; COLOMBIA; GOLD

The Marmato Mining District is located at Setentrional Andes of Colombia near Manizales city. The mineralizations are located within the Calima Terrain, which is bounded by the Cauca and Romeral Faults. The regional rocks are graphite and chlorite-schists of Arquia Complex (Cretaceous), sandstones, shales and conglomerates of the Amagá Formation (Miocene) and the youngest Combia Formation (pyroclastic rocks with clasts of basalt, andesites and mafic lavas, associate with some 9 - 6 Ma sub-volcanic andesitic and dacitic bodies. One of these bodies is the Marmato Stock, which is the host-rock of the Au-Ag mineralizations.The dacite contains abundant ore epithermal veins with low-sulphidation, which occurs as distentional veins, stockwork and in brecciated zones with quartz veinlets. In general the ore consists of pyrite, sphalerite and galena and chalcopyrite, arsenopyrite, pyrrotite, argentite and gold electrum subordinate. A sample of sericitized plagioclase yielded an precise K-Ar age of 5.6 ± 0.6 Ma, which is interpreted as the time of ore deposition. This age is in agreement with the Cauca-Romeral Fault System reactivation (5.6 ± 0.4 Ma). The 6.7±0.1 Ma host porphyry andesite-dacite have 87Sr/86Sr between 0.70440 and 0,70460, eNd between + 2.2 and + 3.2 and Pb isotopic compositions of 18.964-19.028; 15.561-15.570 and 38.640-38.745 for 206Pb, 207Pb and 208Pb. The present-day 87Sr/86Sr, eNd and Pb isotopic ratios of the rocks of Arquia Group range from 0,70431 to 0.73511, from -12,91 to +10. and 18.948-19.652; 15.564- 15.702 and 38.640-38.885. The 87Sr/86Sr and the eNd obtained on sulphides from the gold quartz veins, which occurs at shallow and intermediary levels range from 0.70500 to 0.71210 and from - 1.11 to + 2.40, while for the deepest veins, the eNd are between + 1.25 and + 3.28 and the 87Sr/86Sr of calcite and pyrite fall between 0.70444 and 0.70930. The 206Pb/204Pb, 207Pb/204Pb and 208Pb/204Pb ratios of all mineralizations are 18.970 - 19.258; 15.605 - 15.726 and 38.813 - 39208. The carbonates present 87Sr/86Sr of 0,70445, which is the same value of the host dacite. The Sr isotopic data indicate that carbonatic fluids have a restrict hydrothermal circulation, within the host igneous body. On the other hand, the Sr, Pb and Nd isotopic compositions of the sulphides suggest that the fluids seems to have circulated not only within the Marmato Stock, but also through the Arquia Complex, becoming these rocks a new target for mineral exploration.

8-15 Oral Hu, Ruizhong

NOBLE GAS ISOTOPES OF ALKALINE INTRUSION-ASSOCIATED GOLD AND COPPER DEPOSITS, SW CHINA

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Keywords: Alkaline intrusion; Copper and gold deposits; Helium and argon isotopes; Ore-forming fluids; SW China

Alkaline igneous rocks, such as shoshonites and alkaline porphyries, have recently attracted much attention among geoscientists worldwide, mainly due to their associated mineralization, and their importance in reconstructing the tectonic setting of ancient terranes into which they were intruded. It has been established in the past decade that these rocks are closely related to certain types of gold and base metal deposits. The Red River-Jinshajiang strike-slip fault zone on the eastern margin of the Tibetan plateau was originally produced by the India-Eurasia collision ~60-70 Myr ago. Numerous post-collisional, mantle-derived alkaline igneous rocks, with ages of ~40-30 Ma, have been intruded along this fault zone. In recent years, several copper and gold deposits associated with the alkaline intrusions of this region were discovered, such as the Yao'an and Beiya gold deposits and the Yulong and Machangqing copper deposits studied in this paper. The mineralised intrusions are felsic, with SiO2 ranging from 61.4 to 67.7 wt%, K2O+Na2O from 8.1 to 11.5 wt% and K2O/Na2O>1. These deposits, located within or around the Tibetan plateau, have been poorly studied, and therefore the relationship between mineralization and alkaline magmatism has not been well recognised.This paper presents He and Ar isotope analyses of these four deposits. The concentrations of 4He trapped in fluid inclusions of pyrites from the ores are (0.7-54.1)x10-6cm3STPg-1,and those of 40Ar are (0.6-7.3)x10-6cm3STPg-1,3He/4He ratios are 0.3-2.5Ra (Ra represents the 3He/4He ratio of air, 1.39x10-6), 40Ar/36Ar ratios are 316-1736, and 3He/36Ar ratios are 0.2-11.2x10-3. Generally, the 3He/4He, 40Ar/36Ar and 3He/36Ar ratios for the gold deposits are higher than those for the copper deposits. We suggest that the ore-forming fluids of both gold and copper deposits were differentiated from the mantle-derived alkaline magmas, but were diluted by modified air-saturated water (MASW) that experienced intensive interaction with crustal rocks. However, the magmatic fluids responsible for the gold deposits were less extensively diluted by MASW, resulting in higher 3He/4He, 40Ar/36Ar and 3He/36Ar ratios than the copper deposits.

8-16 Oral Vidal, César

EPITHERMAL GOLD DEPOSITS IN PERU

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Keywords: epithermal; gold; deposits; Peru

Gold only and silver-rich gold deposits in South America are particularly abundant in the Peruvian portion of the Andean orogen. Significant new discoveries have been made during the last decade in association with Cenozoic volcanic centers along the Western Cordillera. The largest, economically relevant "grass-root" discoveries of this kind are the Yanacocha, Pierina and Alto Chicama occurrences; all of which show high-sulfidation epithermal character with near-surface oxide overprinting and amenability for diluted cyanide leaching in heaps. Ore grades are 1 to 3 ppm Au with 10 to 100 ppm Ag. Gold- and silver-bearing minerals typically occur as submicroscopic particles in paragenetic association with early covellite with vuggy silica or with late acanthite, barite and chalcedonic silica in breccia matrix. Hypogene sulfide minerals include enargite, covellite and calcosite; hydrothermal alteration is dominated by pyrophyllite and/or alunite. Minor examples of this category are