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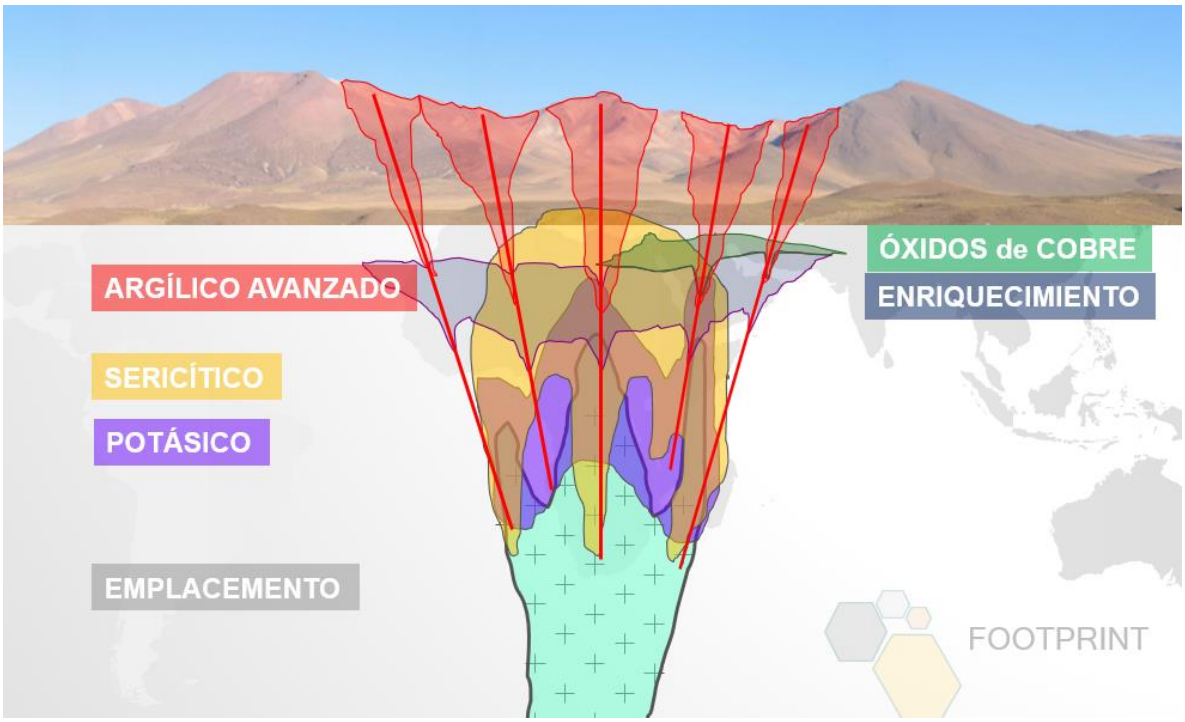
PORPHYRY-Cu HYDROTHERMAL SYSTEMS -INTRODUCTION



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According to some known geoscientists the porphyry copper systems are formed at time-scale ranging from a few hundreds of thousands of years to several million years, occupying spaces varying from some hundreds of cubic meters to several cubic kilometres of rock. Their hydrothermal imprints, also called alteration/mineralization features, evidence abundant episodes overprinting of events supported by various vein systems and singular mineral paragenesis each event or sub-event. This superimposition of episodes makes understanding of these hydrothermal systems being complex.

The complexity of these systems makes they are being better understood when look at them from a 3-D perspective, in order to observe their zonation from the centre to upward and the sides. This complexity is even less diffuse when add the 4-D criteria, that is, the time.

Important to be account 3-D criteria is used seeing hydrothermal events in space-dimension of the system. While adding 4-D we have the possibility observing the mineralization/alteration patterns at a specific point in the deposit over time. If this criteria is extrapolated to the complete deposit, we have the opportunity reconstructing the hydrothermal history, from early stage -k-silicate alteration or silicate building- as well as in hydrolysis stage -buster of silicates- until the system is completely shut down.

To have a better understanding of outlined above is necessary to be taken in account that the hydrothermal history of a particular system begins with the emplacement of the first subvolcanic pulse, which immediately is accompanied by a supercritical fluid (mix of fluid and gas phases released from the magma chamber) that together with the emplaced pulse initiates the development of the early imprint under influence of fluid phase and spatially shallower a more acidic footprint developed by the gas phase. Both the fluid and gas phases circulate continuously throughout at all life of the system, changing in greater or lesser extend its geochemistry and geometry of action, accompanying at all pulses (early-, late- and very late-pulses) and them finish totally weakened until the collapse of the system. Remarkable changes occur throughout the life of both phases supported by variations in temperature, Eh, pH, fugacity of sulphur and oxygen, metallic content, etc., which give rise to episodes of precipitation and hypogene enrichment and impoverishment which occur during the early-, intermediate- and late-stages.

The motive for the current publication, and the next ones, have several objectives:

The first objective corresponds sharing my experience in the field of porphyry systems in order to describe detailly -by my own perspective- the chronology of alteration/mineralization events which are observed throughout at all stages of these systems. These releases will be broken down into three upcoming publications: the first one it will be related to the early phase or k-silicate alteration with its 4 to 5 sub-events; the second one it will be linked to the main hydrolysis stage, which is related to the sericite alteration/mineralization characteristics of high to low temperature); and the third one it will be tied in to the IS (intermediate sulphidation) and/or HS (high sulphidation) stages whose roots are spatially superimposed on the porphyry-Cu system. All of the publications will be supported by

abundant photos of events and sub-events from different deposits at different stages of exploration (basic, advanced and in operation).

The second objective is receiving feedback focused in increase our knowledge and to develop a more complete understanding of these complex hydrothermal systems.

The third objective is related bring support to those who are just taking the first steps in this area, and to be able to somehow guide them on this learning path.

Feel free sharing your comments, points of view and doubts.

Andesite unit affected by three early sub-events: 1) relict of pervasive magnetite-secondary biotite (dark colour); 2) fine-grained k-feldspar-qz intergrowth introduced via channelways within a essentially ductile environment (white and pink colours); 3) All subevent outlined above are superimposed by A-type veinlets array.

C-type vein characterized by phengite-muscovite/chalcopyrite assemblage whose association has been interpreted as high temperature sericite event

Massive bornite and pyrite (E-vein) associated to high sulphidation event overprinted to porphyry body. Notice bornite is strongly replaced by secondary chalcocite supporting that copper sulphides are replaced before which iron sulphides start to be enriched. The white mineral corresponds to hypogene alunite.