The Santo Tomás Deposit, Sinaloa, México: a Particularly Structurally Controlled Porphyry Cu-Mo System and Its Metallogical Implications

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Abstract. Oroco Resource Corporation recently began exploring the porphyry Cu-Mo deposit at the Santo Tomás project, Sinaloa, México. A recent re-estimation of the historical mineral resource indicates 822 million tons with an average grade of 0.32% Cu. The 57.2 Ma Santo Tomás hydrothermal system is developed within Cretaceous-age carbonate rocks that overlie Jurassic-age andesite. Our work indicates that the deposit corresponds to a porphyry dyke complex; porphyritic monzonite intrusions can be followed at the surface for more than 4.5 km. In addition to porphyry-style mineralization, the Brasiles zone and the upper part of the Santo Tomás deposit hosts Zn-Pb-Fe-Ag-Au polymetallic skarn and Au-Ag specularite-mushketovite-quartz veins.

Santo Tomás differs from other porphyry copper-molybdenum deposits by its extended intrusion-related length and dyke-like morphology, but mainly for the Cu-stockwork localized in this inclined porphyry intrusion complex. Laminations are present in all the generations of veins that reach the upper part of the system, suggesting the interaction with meteoritic waters. Field geological observations indicate that a right-lateral component was active along local wrench faults that controlled the emplacement of the deposit. Due to this strong structural control, hydrothermal events are superposed along the same structures, reflected in the greatest copper grades occurring along specific vein directions; mainly the A-veins forming breccia when overprinting the biotite-rich potassic alteration zones. Andesite and limestone host rocks have been altered and mineralized because they acted as lithologic-geochemical buffers for mineralization, creating stockwork zones with locally greater copper grades. We surmise that this is attributable to structural porosity, resulting in wider veins, and reduced density of veins. To explain the abundance of multiples generation of laminated veins, we proposed a model-based of dynamic strike-slip and wrench fault setting that would have created more structural porosity, allowing magmatic fluids to reach a higher level in the system.