Abstract,
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Copper-gold fertile intrusions in the Hualgayoc mining district, Peru

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The Hualgayoc mining district in the Cajamarca metallogenic province hosts numerous Cu-Au deposits, including the Cerro Corona Cu-Au porphyry, the Tantahuatay high sulphidation Au, and the AntaKori skarn/high sulphidation Cu-Au deposits. Our new U-Pb zircon ages show the igneous activity in the entire district between 15 to 10 Ma; the Cerro Corona intrusive complex and the San Miguel diorite being the oldest (14.5 Ma) and the barren Hualgayoc rhyolite the youngest (~10 Ma). Despite similar ages the intrusions show varying alteration and characteristics of parental magmas. Dominant phase of intrusive rocks is hornblende-biotite diorite with magnetite micro-phenocrysts. Volcanic rocks are the Hualgayoc rhyolite near the Cerro Corona intrusive complex, and the andesitic Calipuy formation, which contains clinopyroxene with rare xenocrysts of blue sapphire. Alteration is prevalent excluding Coyomolache sill and the San Nicolas intrusion. Chlorite+epidote alteration affects the San Miguel diorite, Sinchao and Cerro Quijote intrusions. White mica occurs in San Jose, Cerro Jesus and AntaKori. Acid alteration forming pyrophylite ± alunite affects Cerro Cienaga, Cerro Tantahuatay and AntaKori. Potassic alteration forming K-feldspar-biotite-magnetite is found at Cerro Corona and El Molino, and locally in the San Jose intrusion. All intrusions show an “adakite-like” signature of high Sr/Y (50-90) and low Y (5-14 ppm), with the exception of Sinchao and Cerro Quijote intrusions. All show weak Eu anomaly (0.8 to 1.11). The geochemical data suggest high water contents in parental magmas that prompted early crystallization of hornblende and suppression of plagioclase crystallization. Zircon in all intrusions show similar REE patterns with moderate negative Eu anomaly (0.55-0.7) and variable Ce anomaly; very high values (160-200) for Cerro Caballerisa and San Jose intrusions, high values (130-150) for Cerro Corona, San Miguel, Choro Blanco, Cerro Cienaga, Sinchao and Cerro Jesus intrusion, and relatively low values (<100) for Cerro Hualgayoc, Las Gordas, the Coyomolache sill and San Nicolas intrusion. The data suggest that the district is characterized by intrinsically oxidized Miocene magmatism, which is an important factor for the Cu-(Au) mineralization.