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Au-Cu fertile magmas in the Hualgayoc mining district, northern Peru

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The Hualgayoc mining district in the Cajamarca metallogenic province in northern Peru hosts numerous Au-Cu deposits, including the Cerro Corona Au-Cu porphyry, the Tantahuatay high-sulphidation Au, and the AntaKori skarn/high sulphidation Au-Cu deposits. The district is underlain by Cretaceous limestone intruded by several Miocene igneous rocks. The dominant phase of intrusive rocks is hornblende±biotite-bearing porphyritic diorite. This includes the Cerro Corona complex, Coymolache sill, San Miguel diorite, and San Nicolas, Cerro Choro Blanco, Cerro Caballerisa, Cerro Jesus and Cerro San Jose intrusions. Volcanic rocks include the Hualgayoc rhyodacite, the San Miguel clinopyroxene-bearing andesite which contains rare xenocrysts of blue sapphire, and the andesitic to rhyolitic Calipuy formation which partially hosts the Tantahuatay and AntaKori deposits. Hydrothermal alteration is prevalent in all igneous rocks except for the Coymolache sill, San Nicolas intrusion and Hualgayoc rhyodacite. New U-Pb zircon ages obtained in this study indicate that magmatic activity in the district ranged from 14.8 to 9.7Ma, similar to those of the nearby Yanacocha high-sulfidation Au district, 30km south. Most intrusions formed in a 1 m.y. period between 14-15Ma, including the mineralized rocks at Cerro Corona, San Jose, Cerro Jesus, Cerro Caballerisa and Choro Blanco, and apparently barren rocks of Sill Coymolache, San Nicolas and San Miguel intrusions. Mineralized intrusions show high bulk-rock Sr/Y ratios, reflecting high water contents in parental magmas (>4wt% H_2O). They are also characterized by high Ce^{4+}/Ce^{3+} ratios in zircons, indicating high oxidation conditions of parental magmas. The data suggest that Au-Cu fertile intrusions such as Cerro Corona crystalized from intrinsically oxidized water-rich magmas. The data suggest that the Au-Cu fertile and apparently barren magmas were derived from different sources.