The igneous activity in the district was previously thought to range from Paleocene to Miocene in age. New U-Pb zircon ages obtained in this study indicate that igneous activity ranged from 14.8Ma to 7.9Ma, consistent with the high-sulphidation Au deposit. Most intrusions formed between 14 and 9 Ma. Some are associated with Au-Cu fertile magmas. All intrusions show listric-shaped REE pattern (Fig. 3c), reflecting preferential retention of middle REEs by amphibole in the source. Intrusions show a weak Eu anomaly (0.8-1.1), reflecting essentially no plagioclase fractionation.

All intrusions except Cerro Quijote show an “adakitic” like geochemical signature with high Sr/Y ratios (40-90) and low Y (0.8-6ppm) (Fig. 1). High Sr/Y can be explained by high water contents in parental magmas that suppress plagioclase crystallization (Sisson and Grove, 1993). This is consistent with the presence of phenocrysts of feldspar and hornblende in most intrusions.

Low Th content in samples (3.7 ppm) indicates essentially no assimilation of siliciclastic rocks during magma ascent through the thick continental crust (Fig. 4).

The magmatic oxygen fugacity of the intrusions is estimated using Ce4+/Ce3+ in zircon. Zircon from all mineralized intrusions shows low median Ce4+/Ce3+ values (200-290), except the San Miguel intrusion which has low median Ce4+/Ce3+ value (100-200) (Fig. 5). This is consistent with oxidized conditions and Eu +2 under re-oxidation conditions (FMQ +1 to +2). All intrusions show oxidized magma oxidation conditions (FMQ +1 to +2). This may be useful to identify potentially fertile districts.