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Epithermal Au-Ag deposits of New Zealand

Jeffrey L Mauk,
The University of Auckland, Auckland, New Zealand

The Hauraki Goldfield of New Zealand contains about 50 adularia-sericite epithermal deposits with combined total past production and reserves that exceed 10 Moz Au. The largest deposit is the Waihi (Martha) deposit, with past production of over 8 Moz Au.

The goldfield occupies a 200 km long by 40 km wide N-S trending belt of Miocene to Pliocene volcanic rocks in the Coromandel Peninsula of the North Island of New Zealand. Orebodies in the goldfield consist of veins in andesite; less than 10% of production has come from veins hosted by rhyolite. The northern part of the goldfield contains bonanza-grade orebodies at Thames and Coromandel, whereas orebodies in the southern part of the goldfield characteristically consist of relatively thick colloform- to crustiform-banded veins with grades that are commonly 15 ppm or less. The southern goldfield contains over eighty percent of the gold mineralization, even though these orebodies formed in less than ten percent of the time that the goldfield was active. This burst of mineralization may relate to reorganization of the New Zealand plate boundary at approximately 10 Ma.

Vein mineralogy and textures change with depth. Veins that formed at shallow levels typically have fine colloform banding with acanthite and electrum, whereas veins that formed at deeper levels have more coarse-grained quartz and increased concentrations of base metal sulfide minerals.

Orebodies have well-defined alteration halos, with central cores that contain adularia and illite, and larger areas that contain chlorite and interstratified illite-smectite with local calcite. These alteration halos coincide with well-defined geochemical halos, with intense K-metasomatism close to many veins. Igneous magnetite is completely destroyed by hydrothermal alteration, so orebodies characteristically sit within an extensive zone of demagnetized rocks that is readily detected by aeromagnetic methods. The adularia-illite alteration can commonly be detected by airborne radiometric surveys, and K/Th ratios are particularly useful in distinguishing these areas of potassium metasomatism. Therefore, alteration mineralogy, whole rock geochemistry, and geophysical techniques can all provide useful vectors to help delineate areas of hydrothermal alteration that may envelop orebodies.