Antamina is the largest known Cu-Zn skarn deposit in the world with 1,986 Mt of 0.86% Cu, 0.54% Zn, 10.5 g/t Ag, and 196 ppm Mo. Located at 9°32’S, 77°03’W in the central Peruvian Andes, the deposit is hosted in deformed Cretaceous limestones of the Celendín and Jumasha Formations. Skarn alteration and mineralization are focused around a multi-phase Miocene (~10 Ma) intrusive complex that has an alteration footprint of ~3.5 by 1.5 km². Recent drill results indicate that mineralization extends beyond 2.2 km depth. Drill core observations, whole rock geochemistry, and new LA-ICP-MS geochronology ages are presented.

The Antamina intrusive complex consists of at least three early (variably skarn-altered and mineralized) phases and two late (post-skarn) phases identified by cross-cutting relationships, including truncated veins, rare xenoliths, chilled margins, and the abundance of quartz vein stockworks. Modal mineralogy compositions range from quartz monzonite to granite (early) to monzonite (late) with an array of porphyry textures. The late intrusive phases are significantly different from early phases in whole rock REEs and immobile trace element ratios, but the early phases are indistinguishable from each other in major and trace element compositions. Early alteration includes secondary biotite (potassic) transitional to peripheral endoskarn. Late molybdenite-quartz veins cut all early intrusive phases and skarns. Two sets of late-stage dikes have been identified: granite porphyry “Oscarina dikes” are present in the NE highwalls of the pit, while monzonite porphyry dikes cut across the center of the deposit in a NE-SW orientation. Texture-destructive alteration is observed in the Oscarina dikes, whereas monzonite porphyry dikes display only weak chlorite alteration. U-Pb zircon ages are being acquired for all igneous phases.

Seventeen new U-Pb zircon ages have been obtained from 8 intrusions within a 20 km radius of the Antamina deposit. Ages range from 48.5 ± 2.5 Ma to 10 ± 0.37 Ma, with a gap between ~37 Ma and ~10 Ma, resulting in two distinct groups of Eocene and Miocene intrusions. Group 1 (~48-37 Ma) includes 6 dioritic intrusions. Group 2 (~10 Ma) includes 2 intrusions similar in age and composition (granitic) to Antamina.

The range of intrusive ages and compositions in the Antamina district reveal that episodic magmatism has occurred throughout a dynamic tectonic regime. The oldest Eocene intrusions were emplaced during a period of tectonic quiescence approximately 6 Ma prior to the Incaic Orogeny in central Peru, while the youngest Eocene intrusion age coincides with the end of the Incaic Orogeny. An absence of magmatism is observed from ~37-10 Ma, during which time the Quechua 1 orogeny took place (~23-17 Ma). The seemingly sudden onset of district-scale Miocene magmatism began during a tectonic pause, and then waned toward the start of the Quechua 2
orogenic period (~10-7 Ma). Textural, compositional, spatial, and temporal similarities between the Miocene intrusions and the demonstrated fertility of Antamina support the idea of a ~10 Ma intrusion-related mineralization event; however this does not dismiss the potential for other mineralizing intrusions in the district.