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Deep Intrusive and Hydrothermal Activity beneath the Kucing Liar Skarn of Ertsberg Mining District, Papua, Indonesia.

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The Ertsberg Mining District of Papua, Indonesia (Western New Guinea) is host to several economic porphyry deposits, including the giant Cu and Au-rich Grasberg Igneous Complex. Igneous bodies of this region intruded into a synclinal sedimentary sequence in New Guinea's Central Range mountain belt. The sedimentary units comprising the Central Range originally formed during the Mesozoic and Cenozoic along the northern passive margin of Australia. Northward-dipping subduction of the Australian plate beneath the Pacific plate eventually resulted in partial subduction of Australian continental crust and collisional delamination in the Pliocene. Collisional tectonics, which deformed the sedimentary units into a fold-and-thrust belt, also resulted in magma generation at depth when the subducted Australian slab broke off. The Australian-Pacific plate boundary transitioned into a slowly-convergent transform boundary, reactivating thrust faults into strike-slip faults.

The Cu-Au Kucing Liar skarn sits in the southwest area of the Grasberg Igneous Complex, intersected by the strike-slip Idenberg #1 Fault. Two deep whole-rock cores, each 1700 meters long, were recently drilled at the KL98-10 drilling station within the Kucing Liar. Core KL98-10-22, the main focus of this study, extends southwest beneath the Kucing Liar skarn; core KL98-10-21 extends northeast beneath the Grasberg deposit. Parts of these rock cores contain numerous molybdenite veins (which are rare in the rest of the district), a dilatational quartz stockwork vein system, and two previously-unencountered intrusive bodies: the Tikl and Tpi plutons in KL98-10-22.

Ongoing analyses of KL98-10-22 samples include petrologic, geochemical, isotopic, and geochronologic studies. Visual/petrographic inspection of thin sections and polished rock slabs, as well as X-ray diffraction of powdered rocks, are used to determine primary and secondary mineral assemblages (in veins and disseminated through rock). These observations also guide selection of the least-altered, representative samples for geochemical and geochronologic analyses. Geochemical measurements determine magma type, while isotopic Pb-Sr-Nd data constrain mantle sources and crustal modification.

Previous K-Ar, ^{40}Ar-^{39}Ar, and Re-Os dates place Ertsberg district formation between 2.54 Ma and 4.44 Ma. Laser-Ablation Inductively-Coupled Plasma Mass Spectrometry (LA ICPMS) is currently being used to measure ^{238}U-^{206}Pb and ^{207}Pb-^{206}Pb ratios in magmatic zircon crystals, allowing comparison of the newly discovered intrusions with regional igneous activity. The KL98-10-22 Tikl and Tpi units yield weighted average U-Pb ages of 3.3 to 3.8 +/- 0.2 Ma (Tikl) and 3.0 to 3.3 +/- 0.1 Ma (Tpi). These results indicate that the Tikl and Tpi intrusions are part of the same magmatic episode as the Main Grasberg Intrusion and the nearby Ertsberg Intrusion. Cathodo-Luminescent (CL) imaging of zircon crystals reveals several phases of growth and magmatic zonation for zircons from the Tpi and Tikl intrusions, including many zircon cores. Cores give ^{238}U-^{206}Pb ages ranging from ~65 to ~800 Ma and ^{207}Pb-^{206}Pb ages ranging from 1060 to 2540 Ma, providing new evidence for magmatic involvement of underlying Precambrian crust.

Keywords: Hydrothermal/porphyry ore systems, New Guinea, Grasberg, molybdenite, zircon, U-Pb, Cathodo-Luminescence