

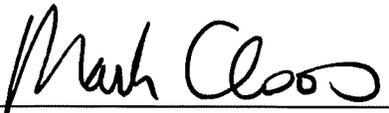
GEOCHEMISTRY AND ZIRCON U/PB GEOCHRONOLOGY OF THE ERTSBERG PLUTON, ERTSBERG-GRASBERG MINING DISTRICT, PAPUA, INDONESIA: MAGMA CHAMBER RECHARGE AND MIXING

Jacob Makis
ABSTRACT

The Ertsberg Pluton is the largest (>10 km³) and youngest (3.1-2.8 Ma) igneous body within the renowned Ertsberg-Grasberg mining district of Papua, Indonesia. It is associated with ore-grade Cu-Au mineralization in the form of three large skarns and a localized zone of classic porphyry style mineralization. Ertsberg rocks range from quartz monzodiorite/monzodiorite to quartz monzonite/monzonite, but overall the intrusion has long been described as relatively homogeneous, the product of emplacement of a single batch of magma that underwent fractionation.

In this study, major and trace element geochemistry was combined with LA-ICP-MS zircon U/Pb ages to constrain the emplacement and evolution of the pluton. A suite of 57 samples were analyzed, 24 of which are from two NE-SW trending drillholes, that are up to 1200m long. Out of the entire suite, 34 samples have zircon U/Pb ages and 31 samples have ϵNd and $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic measurements. When all samples are plotted on standard Harker diagrams for SiO_2 and MgO , apparent fractional crystallization trends are observed. However, when the geochemistry is paired with U/Pb ages, the oldest samples are the most felsic and the youngest samples are the most mafic. Trace elements mimic this relationship with the youngest samples having high concentrations of Sc, V, Ni and Cr. Furthermore, the ϵNd and $^{87}\text{Sr}/^{86}\text{Sr}$ data defines a mixing curve and when the compositions are plotted against U/Pb ages, ϵNd increased and $^{87}\text{Sr}/^{86}\text{Sr}$ decreased through time.

These trends are opposite to those expected for a single batch of magma that underwent fractional crystallization. Ertsberg Pluton is explained by incremental emplacement of an original intermediate composition magma that was blended with increasing proportions of recharging mafic magma. Petrographic observations indicative of recharge and incremental emplacement include resorption features like sieve plagioclase and albitic cores surrounded by anorthitic rims.



Advisor: Mark Cloos