THE TECTONIC HISTORY AND MINERAL DEPOSITS OF THE EAST-CENTRAL KALIMANTAN VOLCANIC BELT, INDONESIA: A COMPARATIVE STUDY OF THE KELIAN, MUYUP AND MASUPA RIA GOLD DEPOSITS

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TABLE OF CONTENTS

Page

LIST OF FIGURES

CHAPTER 1

CHAPTER 2

ABSTRACT

The East-Central Kalimantan Tertiary volcanic belt in Indonesia is host to several gold deposits, the largest known example being the Kelian deposit. A comparative study has been made of the geological environment and orebody characteristics of Kelian and two smaller deposits, Muyup and Masupa Ria. All three deposits show spatial relationships with volcanic and subvolcanic rocks.

The Kelian gold deposit, which is located in the Kutai Basin, is associated with subvolcanic and volcanic rocks of calc-alkaline basaltic andesite to dacite composition. The volcanism took place as a result of continued subduction of the South China Sea plate beneath Kalimantan during Early Miocene time. Mineralization was essentially contemporaneous with the emplacement of the subvolcanics, and was concentrated along the contact between andesitic intrusive rocks and pyroclastics. Altered andesites, pyroclastics and breccias are the main host rocks for gold mineralization. Disseminated pyrite dominates the ore with additional sphalerite, galena, chalcopyrite and marcasite also being observed.

Several stages of hydrothermal alteration have been identified at Kelian. Stage 1, silicification, is characterized by the development of quartz ± pyrite ± carbonate. Stage 2, propylitic alteration, is represented by chlorite ± carbonate ± pyrite ± quartz. Stage 3, sericitic alteration, is marked by the development of sericite ± carbonate ± quartz ± pyrite ± gold. Stage 4, carbonate-base metal alteration, consists of sphalerite ± chalcopyrite ± pyrite ± gold. Stage 5, argillic alteration, involved deposition of clay minerals ± marcasite ± gold. The Kelian deposit shows the mineralogy and alteration of low sulphidation epithermal gold deposits. Fluid inclusion and chlorite geothermometry show that hydrothermal activity took place over a wide range of temperature (approx. 350° to 100°C). Stable isotope studies suggest that the hydrothermal system was dominated by magmatic water and that sulphur and carbon were also of magmatic origin.

The Muyup prospect (also located in the Kutai Basin) is associated with basalt to basaltic andesites of the shoshonitic suite. These rocks, which are related to the collision of the South China Sea plate with Kalimantan during the Late Oligocene to Middle Miocene, intruded the Muyup volcanics which are the main host rocks to the gold deposits. Mineralization is concentrated along the contact between the Muyup volcaniclastics and the

basaltic andesite rocks. Ores consist of the sulphide minerals pyrite, sphalerite and marcasite, with gold and associated alteration assemblages similar to those observed at Kelian.

Limited fluid inclusion data suggest that the hydrothermal fluids at Muyup were lower in temperature (approx. 260° to 200°C) and salinity compared to Kelian. Stable isotope data indicate that the hydrothermal system was probably dominated by heated meteoric water which leached sulphur from disseminated sulphides in volcanic and sedimentary rocks.

The Masupa Ria prospect, located in the Barito Basin, is spatially related to andesites of the calc-alkaline and high-K calc-alkaline series. The collision of the South China Sea plate with Borneo (Late Oligocene time, 24.6 ± 0.4 Ma) was also responsible for the emplacement of these rocks. The Masupa Ria volcanics, which are the main host rocks, were intruded by subvolcanic andesites.

Ore mineralogy of the Masupa Ria deposits consists of the sulphide minerals pyrite, sphalerite and stibnite, and gold. Alteration assemblages are similar to those in the Kelian and Muyup deposits with the exception of the argillic assemblage, which is not observed at Masupa Ria.

Fluid inclusion and chlorite studies indicate that hydrothermal activity took place over a wide range (approx. 350° to 100°C). Salinities of the fluid were slightly higher than for Muyup but generally lower than at Kelian. Stable isotope data indicate a similar hydrothermal system to that at Muyup in terms of origin of fluid and components.

The three deposits show similarities in tectonic environment (island-arc subduction process) and low sulphidation epithermal types. The differences between the deposits are the emplacements of subvolcanic intrusions, type of subvolcanic rocks, source for metals and size of ore deposit.