

# Platinum Group Element Geochemistry of Andesite Intrusions of the Kelian Region, East Kalimantan, Indonesia: Implications of Gold Depletion in the Intrusions Associated with the Kelian Gold Deposit

BAMBANG T. SETIABUDI, IAN H. CAMPBELL,<sup>†</sup> CANDACE E. MARTIN,<sup>\*</sup> AND CHARLOTTE M. ALLEN

*Research School of Earth Sciences, Australian National University, Canberra, ACT 0200, Australia*

## Abstract

Nineteen andesite samples from the Kelian gold mine and two adjacent prospects, Magerang-Imang and Nakan, in East Kalimantan, have been analyzed for Cu, Re, Au, and the platinum group elements (PGE). The aim of the study was to use variations in PGE concentrations to test whether the chalcophile elements became enriched or depleted with fractionation in the igneous suites associated with the Kelian deposit. When the data are plotted on mantle-normalized chalcophile element diagrams, the patterns for the Magerang-Imang and Nakan suites are subparallel over a range of PGE concentrations of about 20 times. Pd/Ir ratios for Magerang-Imang hornblende andesites and Nakan pyroxene andesites are 15 to 54 and 60 to 129, respectively. The lower Pd/Ir ratios for the Magerang-Imang suite are due to a reversal in the slope of the mantle-normalized pattern between Ir and Os that is not seen in the Nakan suite. All PGE concentrations from both the Magerang-Imang and Nakan suites decrease with increased fractionation. Furthermore, all samples, which have not been subjected to strong alteration, are strongly depleted in Au relative to adjacent elements on mantle-normalized chalcophile element plots. Crosscutting relationships show that the gold mineralization at Kelian is younger than the associated Central and Eastern andesite intrusions, so they cannot be the source of the gold in the deposit. The gold was probably derived from slightly younger intrusions, similar in age to the adjacent Magerang-Imang hornblende andesites, which appear to be coeval with the mineralization and which are also depleted in gold. The subparallel PGE patterns preclude the depletion of Cu, Au, and PGE by sulfide fractionation, which would fractionate highly chalcophile PGE from less chalcophile Cu and Re. We suggest that the parallel Cu-Au-PGE patterns are due to mixing between a relatively mafic PGE-rich magma and a more felsic magma with lower PGE concentrations.

<sup>†</sup> Corresponding author: e-mail, Ian.Campbell@anu.edu.au

<sup>\*</sup> Current Address: Geology Department, University of Otago, Leith St., P.O. Box 56, Dunedin 9054, New Zealand.