Constraints on eclogite facies metamorphism in southeastern Papua New Guinea from *in-situ* ion microprobe U-Pb and REE analyses

B.D. MONTELEONE, S.L. BALDWIN, L.E. WEBB, AND P.G. FITZGERALD

Department of Earth Sciences, Syracuse University, Syracuse, NY 13244, U.S.A. (bmontele@syr.edu)

In-situ ion microprobe analyses were conducted on zircon and garnet within eclogites from the D'Entrecasteaux Island metamorphic core complexes in order to constrain the timing of high pressure (HP) metamorphism prior to exhumation. Eclogite assemblages consist of garnet + omphacite + quartz + rutile + kyanite overprinted during retrograde metamorphism by pargasite + plagioclase symplectite. P-T estimates based on the jadeite component of clinopyroxene and garnet-omphacite cation partitioning range from 19 - 24 kbar (minimum) and 750 - 930˚C. Zircon grains are unzoned in backscattered imaging, with grain size ranging from 10 - 50 µm in the longest dimension. Zircon grains >100 µm in longest dimension occur, but are rare. ^{238}U-^{206}Pb analyses on six variably retrogressed eclogites yield a single age population for each sample. However, a spread of sample ages exists ranging from 7.9 – 4.3 Ma on Fergusson Island, and from 2.9 – 2.0 Ma on Goodenough Island. Zircons yield trace and REE analyses characterized by a positive Ce anomaly and an absent or subdued negative Eu anomaly when normalized to chondrite, suggesting zircon growth in the absence of abundant retrograde plagioclase. Suppressed enrichment of heavy REE concentrations for both zircon and garnet relative to chondritic values suggests coeval growth of these phases under eclogite facies conditions during Pliocene HP metamorphism. Rapid exhumation rates (>1 cm/yr) are inferred from Pliocene metamorphism at ~70 km depth of rocks presently exposed at the earth's surface.

Rutile geochemistry as a guide to mineralization at the Escondida Cu deposit, Chile

K. M. SCOTT[1] AND D. H. FRENCH[2]

[1]CRC LEME(Cooperative Research Centre for Landscape Environments and Mineral Exploration) c/- CSIRO Exploration and Mining, PO Box 136, North Ryde, NSW 1670, Australia (keith.scott@csiro.au)

[2]CSIRO Energy Technology, Private Mail Bag 7, Bangor NSW 2234, Australia (david.french@csiro.au)

The compositions of accessory minerals formed during hydrothermal processes may reflect those mineralizing processes, *e.g.,* porphyry-related rutiles have low (Nb+Ta):(Cr+V) ratios (Williams and Cesbron, 1977). Furthermore, if such minerals are stable during weathering processes, they are particularly useful as a guide to mineralization when the sulfides are completely leached out.

At the Escondida Cu deposit, mineralization occurs as veined sulfides in strongly phyllic alteration within Middle Oligocene porphyries and their host Upper Cretaceous/Lower Tertiary andesites. However, late stage brecciation and advanced argillic alteration and deep weathering related to Miocene uplift and erosion have also affected the deposit so that the Cu in the upper 150-200m of the deposit is strongly leached.

Electron Microprobe analyses of 1248 rutile grains from 54 samples in both fresh and weathered material from Escondida indicate that the generally 50-60 µm-sized rutile is generally complexly zoned, with that associated with the porphyries Nb-rich (up to 7.0 %) relative to the host rocks and that associated with mineralization enriched in W (up to 7.1%) in specific areas. This hydrothermal elemental enrichment can still be observed in rutiles from highly leached material even in "superleached" zones where other potential resistate minerals have been destroyed. Thus rutile compositions are potentially useful indicators of Cu mineralization in Chile.

Reference

Williams S.A. and Cesbron F.P., (1975), *Mineralogical Magazine* **41,** 288-292.