Nature of the Parental Source Material(s) for the Placer Gold-Bearing Banket Conglomerate, Ghana: Constraints from δ18Owater in the Quartz Pebbles

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Many hydrothermal sources can be invoked for the parent quartz vein materials that were eventually eroded to supply the quartz pebbles for the Banket conglomerate. These fluid sources could have signatures that suggest magmatic-hydrothermal (+6 to +10‰ δ18Owater), seawater-hydrothermal (~0±2‰ δ18Owater), meteoric-hydrothermal (<0‰ δ18Owater), metamorphic-hydrothermal (+4 to +25‰ δ18Owater). These fluids are associated with particular environments or deposit-type such as epithermal gold deposits (meteoric with or without contributions from magmatic fluids), Mesothermal and hypothermal gold deposits (metamorphic and/or magmatic), gold-rich Volcanogenic Massive Sulphide deposits (seawater, with or without contributions from magmatic fluids), porphyry copper-gold deposits (magmatic).

Klemd et al. (2015) showed that the quartz pebbles from the Banket conglomerates mostly contain high density CO2-N2 fluid inclusions, with rare or no aqueous H2O-NaCl at temperatures > 300 to 450 ºC considering immiscibility in the CO2-N2-H2O system and/or ductile environment within the deep crust and a temperature of < 350ºC for dominant H2O-CO2-NaCl composition in a brittle environment. Therefore, based on this deduction, a temperature of 350-450ºC was considered for evaluating the δ18Owater in the Banket conglomerates in this study. Result for fluid preserved in quartz-pebbles (+5.9 to +10.1‰) shows that the calculated δ18Owater values fall within the range for magmatic and/or metamorphic water. This suggest the source(s) of the quartz-pebbles were originally hydrothermal quartz veins from Mesothermal lode-gold and/or porphyry copper-gold deposits. However, the lack of copper in the Banket conglomerate eliminates porphyry copper-gold deposits as source material. Therefore, ancient Mesothermal lode-gold deposits are the most likely sources for the gold-bearing reefs of the Banket conglomerates.

Although Mesothermal lode-gold deposits are genetically similar, deduction structural analysis across the Birimian-Tarkwaian contact by Perrouty et al. (2015), suggest that these eroded ancient Mesothermal lode-gold deposits are older than the currently known Mesothermal lode-gold deposits along the left flank of the Ashanti metavolcanic belt.