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High-K to shoshonitic magmatism across the northern Archean Kéména Man margin (Guinea): Implications for the late Eburnean orogenic gold mineralizations

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The Baoulé-Mossi Paleoproterozoic domain on the West African Craton is known for its world-class orogenic gold deposits formed during the Eburnean orogeny between ca. 2.15 and 2.07 Ga [1, 2, 3]. This domain consists of low-grade Birimian greenstone belts intruded by Tonalite-Trondhjemite-Granodiorite (TTG) suites and potassic granitoids [4].

As part of the orogenic cycle, a suite of intermediate and felsic weakly deformed to unfoliated potassic intrusive rocks was emplaced from ca. 2.10 Ga to 2.07 Ga along the Paleoproterozoic margin of the Archean Kéména Man craton, in Guinea. These high-K to shoshonitic intrusive rocks are characterized by (i) enrichment in LILE and LREE, (ii) depletion in HFSE and (iii) strong Pb spikes but based on zircon U-Pb-Hf isotope data two groups can be distinguished, each comprising Qtz-monzodiorites and Bt-granites. Plutonic rocks of group I, sampled in close vicinity to the Kéména-Man craton, show highly negative $\varepsilon Hf_{(2.1\ Ga)}$ of -18 to -10 (corresponding to Hf model ages – T_{DM} – of 3.5–3.2 Ga). These intrusive rocks contain abundant zircon xenocrysts with ages between 3.71 and 2.88 Ga (T_{DM} = 4.1 to 3.5 Ga), overlapping with zircon U-Pb-Hf data obtained from three granodiorites of the nearby craton. Rocks of group II, sampled away from the craton, are xenocryst-free and despite similar or higher Zr-saturation temperatures (770–905 °C) compared to group I rocks (720–800 °C). These rocks reveal mostly superchondritic $\varepsilon Hf_{(2.1\ Ga)}$ up to +4.1 and younger Hf model ages of 2.7–2.4 Ga. Combination information from zirconology, geochemistry and field relationships suggest that the potassic plutonites result from partial melting of different sources within the crust and mantle at 2.10–2.07 Ga. The Qtz-monzodiorites derived from metasomatized mantle sources enriched by subducted sediments that in case of group I were derived from the Archean Kéména-Man craton, and in case of group II from relatively juvenile Paleoproterozoic island arcs; requiring a complex geodynamic setting with different subduction zones and island arcs prior to the Paleoproterozoic collision. Bt-granites of group I can be explained by *in-situ* reworking of Archean TTG crust, in agreement with xenocrysts and low Zr saturation temperatures, whereas Bt-granites of group II might result either from reworking of relatively juvenile Paleoproterozoic crust, or from a hybridization between (fractionated) diorites and hot crustal melts at 2.10–2.07 Ga.

Contemporaneous partial melting of the different mantle and crustal domains perhaps happened in response to lithospheric delamination after the collision of the juvenile Paleoproterozoic Baoulé-Mossi (island arc) domain with the Archean Kéména-Man nucleus. The reworking of metasomatized lithospheric mantle through the remobilization of metasomatic amphibole veinlets enriched in gold [5] may have been a fundamental process for the formation of late orogenic gold deposits in the Baoulé-Mossi domain.

References:

[1] Goldfarb R et al. (2001) Ore Geol Rev 18: 1-75
[2] Feybesse J-L et al. (2006) Precambrian Res 149: 149-196
[3] Béziat D et al. (2008) J Afr Earth Sci 50: 215-253
[4] Baratoux L et al. (2011) Precambrian Res 191: 18-45
[5] Wilson M.R. et al. (1996) Geochim Cosmochim Ac 60: 1933-1942