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Geochemitry of the Xiong'er volcanic rocks: Implications for the Paleo-Mesoproterozoic accretion of the North China Craton

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The Xiong'er volcanic belt along the southern margin of the North China Craton is dominated by basaltic andesite and andesite with minor dacite and rhyolite. Geochemically, the Xiong'er volcanic rocks fall in the calc-alkaline series, with enrichments in the LILE and LREE, and negative anomalies on Nb-Ta-Ti, similar to arc-related volcanic rocks (He *et al.* 2008; Zhao *et al.* 2009). Available SHRIMP and LA-ICP-MS U-Pb zircon age data indicate that the volcanism forming the Xiong'er volcanic rocks erupted intermittently over a protracted interval from 1.78 Ga, through 1.76-1.75 Ga and 1.65 Ga, to 1.45 Ga, though a major phase of the volcanism occurred at 1.78-175 Ga (He *et al.* 2009). Taken together, the Xiong'er volcanic belt was most likely a Paleo-Mesoproterozoic continental magmatic arc at the southern margin of the North China Craton. Age-similar continental magmatic arcs were also present at the southeastern margin of Laurentia, southern margin of Baltica, northwestern margin of Amonzonia, and southern and eastern margins of the North Australia Craton, which are considered to represent subduction-related outbuilding on the continental margins of the supercontinent Columbia (Zhao *et al.* 2004).

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Genesis of gold deposits in the Xiaoqinling district, southern margin of the North China Craton

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The Xiaoqinling gold district is the second largest gold producing center in China and is located in a basement-cored uplift along the southern margin of the North China Craton. The ore is hosted mainly by quartz veins and subordinately by adjacent alteration zones within Archean amphibolite-facies basement rocks. The mineralised veins consist, apart from quartz, of carbonates, pyrite, galena, chalcopyrite, sphalerite and locally molybdenite (*e.g.* Dahu Au-Mo deposit). Gold occurs predominately in textural association with pyrite. Wall rock alteration encompasses pyrite, quartz, sericite, carbonates, epidote, chlorite and K-feldspar.

In view of a Au-Mo association at some localities and the presence of two late Yanshanian (~140 Ma) granite plutons, a genetic link with this magmatism may be possible. The Au deposits are, however, 2 to 10 km away from these granite bodies and bear otherwise typical characteristics of orogenic gold (low salinity, CO_2-rich ore fluids; spatial association with large-scale compressional structures of the Qinling orogen; $\delta^{18}O$ and δD data suggestive of mixing between metamorphic and meteoric waters; $\delta^{34}S$ and Pb isotopic data that point to a mixed crustal-mantle source) as shown in previous studies.

Re-Os dating of molybdenite from the Dahu gold deposit yielded Indosinian model ages of 223 - 232 Ma [1] and an isochron age of 218 ± 41 Ma [2], which are suggested to date the main stage of gold mineralization.

We propose that mineralization was a consequence of subduction during Indosinian collision between the North China Craton and the Yangtze Craton. Metamorphic devolatilization of the subducted slab would have provided the main source of the ore fluids. In places, some remobilisation of the ores may take place during Yanshanian crustal thinning, but more work, in particular field relation and precise age dating, are needed.

[1] Li *et al.* (2007) *Mineral Deposits* **26**(4) 417-424 (in Chinese) [2] Li *et al.* (2008) *Acta Petrol Sin* **24**(4) 810-816 (in Chinese).