Orogenic gold deposit in the Yilgarn craton: a review

Nicolas Thébaud¹ and J. Miller¹

1.

School of Earth Sciences, Centre for Exploration Targeting, University of Western Australia, Crawley, WA6009. nicolas.thebaud@uwa.edu.au

ABSTRACT

Neoarchaean lode-gold deposits developed within a relatively narrow time window during major episodes of juvenile continental crust formation and crustal anatexis (Goldfarb et al. 2001). These deposits are associated with deep-sourced fluids channelled along crustal-scale shear zones hosted within quartz-filled fault and fracture meshes that formed in association with brittle-ductile shear zones. Deposit scale studies highlight the characteristics of gold mineralization and suggest a set of common characteristics including a spatial relationship to compressional crustal-scale structures, a consistent sulphide mineralogy and metal inventory (Groves et al. 2003). These characteristics defined at the deposit scale aim at defining the geometry and nature of individual ore deposits in order to better understand their genesis and help targeting of additional mineral resources. However, despite decades of research the success rate of the mineral exploration using such models has been steadily decreasing (McKeith et al., 2010).

Deposits are the expression of a much larger set of geological processes leading to their formation (McCuaig and Hronsky, 2014). Accordingly, in order to define the elements critical to mineral system formation, one must encompass the breadth of deposits present in a mineralised region. Archean lode gold deposits are generally grouped under the orogenic class of deposits. Closely related to the orogenic gold deposits is a less coherent group of deposits, or hybrid deposits, that are commonly associated with an intrusive related class of deposit (Groves et al. 2003). Both orogenic and atypical deposits are yet to be reconciled within the traditional orogenic gold deposit model. Through the review of historical datasets and using newly acquired geochronology and sulfur isotope data collected on structurally constrained samples from the Kalgoorlie, Leonora, Agnew, and Wiluna districts this paper aims at incorporating the variety of mineralization styles recognised in the Yilgarn Craton into a renewed metallogenic model.

REFERENCES

Goldfarb RJ, Groves DI, Gardoll S (2001) Orogenic gold and geologic time: a global synthesis. Ore Geology Reviews 18:1-75.

Groves DI, Goldfarb RJ, Robert F, Hart CJ (2003) Gold deposits in metamorphic belts: overview of current understanding, outstanding problems, future research, and exploration significance Economic Geology. Society of Economic Geologists, pp 1-29.

McCuaig, T.C., Hronsky, J., 2014. The mineral system concept: the key to exploration targeting, Society of Economic Geologists Special

McKeith, T.D., Schodde, R.C., Baltis, E.J., 2010. Gold discovery trends. Society of Economic Geologists Newsletter 81, 20–26.