Gold and base metals prospectivity in the North of the Arabian-Nubian Shield: an Egyptian and Saudi Arabian perspective

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Résumé

The north of the Arabian-Nubian shield is an underexplored metallogenic province for base and precious metals hosted by the Central Eastern Egypt domain and Mydian/Hijaz terranes of Saudi Arabia. A variety of deposit types have been identified, such as Cu-Zn VMS, Au-Ag epithermal located near or along ophiolites / suture-like series, and orogenic and intrusive-related gold mineral systems located both along Nabitah and Najd second-order structures, close to mafic or ultramafic lithologies, sometimes concentrated in the vicinity of syn- to late-orogenic granitoids or metamorphic core complexes (Hafafit, Nugrus and Qazaz-related domes).
This study aims to identify the spatial and genetic relations between the litho-structural context and mineral occurrences within the Nugrus-Qazaz structural belts to build tailored metallogenic models for the studied area. This GIS-based study consists of an hybrid approach to build prospectivity maps using the following steps : i) establishing the key components and mappable criteria of gold mineral systems (*knowledge-driven*); ii) the compilation, harmonization, reclassification and digitalisation of spatially referenced geoscientific data (e.g. harmonizing 250k maps) to obtain homogenous and accurate entry data (*data-driven*) ; iii) and then processing them with geostatistical tools applied on key criteria for the targeted mineral systems.

Through the review of the whole dataset, we elaborated a lithostratigraphic timescale displaying local geological events, merging groups and formations, resulting in a new harmonized classification. New metallogenic maps now highlight the key geological factors controlling the distribution of precious and base metals occurrences (e.g. basin margins, intermediate to felsic dykes, NE- to EW-trending shear zones, fertile lithologies) within a polyphased tectono-metamorphic setting from the syn-collisional Nabitah tract (ca.710Ma) to late-orogenic collapse recorded by the Nugrus and Qazaz structural domains. The latter may represent significant pathways for gold-bearing metamorphic and magmatic-derived fluid circulation in the region.
The preliminary results highlight the singular location of the Sukari, Al Wajh, Umm Lajj and

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Buwaydah gold districts located between two large gneissic domains, the Hafafit and Nugrus-Qazaz shear zones, near numerous syn- to late-orogenic granitoids intruded at ca.620Ma (eg. Ar Ra'al) and associated with the development of molassic carbonate-dominated basins (e.g. Thalbah basin).

Mots-Clés: Arabian Nubian shield, Gold mineral system, Geographic information system, Prospectivity