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Pan-African shear zone-hosted gold mineralization in the Arabian-Nubian shield

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A new tectonic model of the exhumation mechanism of the Arabian-Nubian Shield will be presented at the EGU2013 by Abu-Alam and Stüwe (2013). According to this new tectonic model, the shear zones of the Arabian-Nubian Shield can be classified into two types; deep-seated and relatively shallow shear zones. The deep-seated shear zones are accompanied with deep sub-horizontal crustal channel flows which are response to the exhumation of the metamorphic complexes from the peak condition depth to a shallower crustal level (ductile-brittle transition). An example of these deep-seated shear zones is the Najd Fault System – the largest shear zone on the Earth. At the ductile-brittle transition crustal level, the deep-seated shear zones were overprinted by a greenschist facies condition or the σ_2 and σ_3 of the principle stresses may be flipped with each other. This flipping can produce other conjugate shallow shear zones in a greenschist facies conditions.

The Egyptian gold deposits can be classified into three main types (Botros, 2004), These are stratabound deposits, non-stratabound deposits and placer gold deposits. The non-stratabound deposits are the most common (ex: Sukari, Wadi Allaqi, Abu Marawat, Atalla, El-Sid and Atud gold mines). They are found in form of vein type mineralization or as disseminated mineralization hosted in volcanics and volcaniclastic rocks (volcanogenic massive sulphides). Spatial and temporal relationships between gold veins and structures in the Arabian-Nubian Shield suggest a genetic relationship between mineralization and major tectonic events.

At Sukari, Wadi Allaqi and Abu Marawat areas, the gold is hosted in quartz veins parallel to a deep-seated NW-SE to NNW-SSE shear zones. For Atud, El-Sid and Atalla area, the gold is hosted in NE-SW veins parallel to a shallow shear zone but at the conjugate point with a deep-seated NW-SE shear zone.

According to the new tectonic model, we propose the following model for gold formation (non-stratabound). They were deposited from hydrothermal solutions which were produced in a deeper crustal level due to metamorphic or magmatic processes or combination between both. These solutions transfer through the deep-seated shear zones which cutting the all rock unites of the shield. The hydrothermal solutions can leach the gold out from a source rock (e.g. ophiolitic or gabbroic rocks). Once the solutions enter the ductile-brittle transition crustal level, the quartz veins and the hosted gold begin to precipitate parallel to the regional foliation of the deep-seated shear zones.

Abu-Alam T.S. and Stüwe K. (2013) Sub-horizontal channel flow: an exhumation mechanism during the Gondwana collision. EGU2013-9778

Botros N. (2004) A new classification of the gold deposits of Egypt, Ore Geology Reviews 25, 1 –37