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The application of morphological and microchemical analysis of alluvial gold grains to mineral exploration: A case study in the Gaerqin area, Tibet, China.

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The Gaerqin locality lies within Duolong porphyry Cu-Au district, central Tibet, where bedrock is poor exposure due to strong weathering and denudation. Although there are a large number of placer golds present in local drainages, to date, the location of economic significance mineralization was not discovered. Here we integrated morphological and microchemical characteristics of placer golds to speculate the source of gold grains, thereby permitting a more complete interpretation of the Gaerqin area mineralization potential.

A total of 809 gold grains collected from 14 sites in the Gaerqin area have been analysed in this study, no evidence was found that authigenic gold has a significant influence on the gold population. The qualitative and quantitative evidences of the morphological characteristics suggest that gold grains have a limited transport distance, and the transport distance– flattening indexes (Shilo) model [1] [2] further show that primary sources of gold grains in this study area located at a proximal range (within 5 km). Moreover, about 6% angular grains present in the gold population suggest that the hypogene gold mineralization source in the Gaerqin area may still be eroding.

Microchemical signatures of the gold grains can be used to diagnose the source style of mineralization for alluvial gold [3]. We identified two styles of gold grains in the Gaerqin locality based on their microchemical characteristics, together with the geological feature of the sampling area. Type 1 gold which closes to vuggy silicification altered rock, with complex inclusions assemblages (containing S-, As-, Pb-, Bi-, and Te-bearing inclusions) and higher Hg. In contrast, type 2 gold near the sporadic porphyry outcrop area, which contains a simple inclusion assemblage dominated by pyrite and pyrrhotite, is characterized by lower Hg.

We believe that the two classes of gold grains may have derived from the porphyry-epithermal system, the silicification altered rock area should be given special attention during the future exploration process, which is supported by the latest geological survey evidence.

[1] Knight et al (1999), Economic Geology 94, 635-648. [2] Dos Santos Alves et al (2020), Ore Geology Reviews 121, 103489. [3] Chapman et al (2018), Mineralium Deposita 53, 815–834.