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U-Pb Geochronology of the Archaen Tati Greenstone Belt gold deposits, NE Botswana: Evidence of two post-Archean and post-metamorphic mineralization events.

Charles Geraud E. Kono, Thierry B. Bineli, Peter N. Eze
Botswana International University of Science and Technology, Palapye, Botswana

The Tati Greenstone Belt (TGB) of northeastern Botswana, in the southwestern edge of the Zimbabwe Craton, hosts numerous gold deposits/occurrences including, the Golden Eagle and Mupane gold deposits. Despite being critical to understanding gold mineralization in the greenstone belt, the geochronology of the TGB gold deposits has been remarkably under studied. Here, we report on the U-Pb ages obtained from apatite, titanite, and garnet, assessed to be in equilibrium, and therefore, cogenetic with gold-bearing arsenopyrite from the Golden Eagle and Mupane gold deposits to constrain the time of gold introduction in these deposits. In the Mupane gold deposit, garnet in sample 1 yields a Tera-Wasserburg lower intercept $^{206}\text{Pb}/^{238}\text{U}$ age of 2189.3 ± 22.3 Ma (MSDW = 1.54; n = 66/92), which overlaps with the garnet concordia age 2154 ± 13.3 Ma (MSDW = 1.94; n = 80/177) from sample 2. In the Golden Eagle deposit, titanite yields a Tera-Wasserburg lower intercept $^{206}\text{Pb}/^{238}\text{U}$ age of 1927 ± 18.7 Ma (MSDW = 1.54; n = 21/21), whereas apatite yields a Tera-Wasserburg concordia age of 1960.5 ± 112.5 Ma. This suggests two episodes of post-Archean gold mineralization events within the TGB. The U/Pb age from apatite overlaps with the second cycle of the Limpopo-Liberian tectonic event of 2050 ± 1.5 Ma, which is here considered as precursor event to mineralization in the area. On the other hand, the ages obtained on garnet do not correspond to any recorded geo tectonic event in the TGB, and may be related to either partial resetting of these metamorphic garnets by the second Limpopo tectonic event or a concealed intrusion. Considering the age of the metamorphism (2630 ± 70 – 2570 ± 70 Ma) in TGB, the Mupane and Golden Eagle deposits are therefore here regarded as post-metamorphic orogenic-type gold deposit.