GEOLOGY, GEOCHRONOLOGY AND GOLD METALLOGENESIS OF THE SERRA DAS PIPOCAS GRANITE-GREENSTONE TERRANE, TROIA MASSIF, NORTH BORBOREMA PROVINCE, BRAZIL

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RESUMO: The Troia Massif is one of the biggest Archean/Paleoproterozoic nucleus of the Borborema Province, representing a well exposed basement inlier within this large Neoproterozoic mobile belt. At the Troia Massif, two major Paleoproterozoic metavolcano-sedimentary sequences are recognized: (1) The Algodões sequence to the north and (2) The Serra das Pipocas sequence at the west. These sequences share similar lithostratigraphic characteristics, which are also similar to those from other Paleoproterozoic greenstone belts of the surrounding cratonic domains (e.g., Guiana shield, São Francisco and West Africa cratons) or basement inliers (e.g., Goiás Massif and Gurupi belt). These include extensive mafic and intermediate metavolcanic rocks at lower units and metasedimentary rocks at upper units. All intruded by distinct pulses of plutonic rocks (e.g., gabbros, tonalites, quartz monzonites and S-type granites). We report here U-Pb (SHRIMP and LA-ICPMS) zircon ages and whole-rock (XRF) geochemistry for two major plutonic events recognized at the Serra das Pipocas granite-greenstone sequence; (1) the early (2192 +/- 11 Ma) TTG-like Mirador tonalites and the (2) K-rich granites of the Bananeira Suite (e.g., 2092 +/- 7 Ma porphyritic quartz monzonite, and 2068 +/- 5 Ma for equigranular “pink” monzogranite). Geochemistry for mafic/intemediate metavolcanics of the lower unit shows transitional tholeiitic to calc-alkaline affinity, suggesting an arc/back-arc tectonic setting to this volcanism. The presence of garnet-amphibolites on the lower unit and kyanite-graphite-schist in the upper unit shows that the Serra das Pipocas greenstone sequence was subjected to medium- to high-grade regional metamorphism. Gold mineralization in the Serra das Pipocas sequence has been recently discovered by private exploration project. The mineralized area (Pedra Branca deposit) extends hundreds of meters along strike, and by 1 to 5 meters width across, grading roughly 1 to 3 g/t of gold. The main host rocks of gold mineralization are metatonalites (Mirador area), amphibolites (Coelho area), metandesites and metasedimentary rocks (Queimadas area). In these areas, gold is generally associated to quartz veins and “skarn-type” hydrothermal alteration, including diopside, amphiboles (e.g., uralite), K-feldspar, titanite, pyrite, pyrrhotite, biotite, ilmenite +/- magnetite and minor carbonate. EDS analyses indicate that gold locally occurs as gold-silver-telluride inclusions in titanites and pyrites. Albitite zones (80% albite) with disseminated pyrite, ilmenite/magnetite and free-milling gold at albite grain-boundary are observed from drill cores, and interpreted as hydrothermal alteration (sodium-metasomatism) of mafic/intermediate metavolcanics rocks. U-Pb age (LA-ICPMS) for titanites associated to the “skarn-type” alteration and gold mineralization, yielded two distinct ages in the same concordia diagram; 2029 +/- 27 Ma (two grains at the upper intercept) and 573 +/- 7 Ma (51 grains at the lower intercept). These U-Pb titanite ages suggest that gold mineralization firstly occurred during Paleoproterozoic times, but was later, strongly affected (and remobilized?) by Neoproterozoic regional metamorphism. The genetic model for gold mineralization is thought to be “orogenic gold deposits”. However, because of the high-temperature hydrothermal minerals (e.g., diopside, amphiboles, titanite) associated with gold, it could probably represent a “hypozonal orogenic gold deposit”, or a “mesozonal orogenic gold deposit” submitted to medium- to high-grade regional metamorphism.

PALAVRAS-CHAVE: GOLD, BORBOREMA PROVINCE