EPMA and LA-ICPMS Dating of Hydrothermal REE-Minerals from the Estrela Copper Deposit, Carajás, Brazil

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The Carajás Mineral Province of northern Brazil in the Amazon Craton is host to some of the largest known iron ore reserves (18Gt) and significant Mn, Ni, Au+PGE and Cu±Au deposits. The Estrela copper deposit is a new discovery in Carajás which is interpreted to comprise one of a new class of Cu ± Au - (Ag-W-Sn-Mo-Bi) granite-related deposits along with the Breves, Gameleira and possibly Águas Claras deposits. EPMA monazite analyses from primary quartz-green biotite stockwork veins which are host to copper mineralisation at Estrela provide an age of 1839 ± 14 Ma and display later alteration. Monazite from aplite yields three ages: 1886 ± 19 Ma, 1827 ± 23 Ma and 1716 ± 19 Ma. Allanite from fluorite-sulphide rich secondary stockwork veins gave an isochron age c. 1850 Ma and together with monazite data suggest a major hydrothermal event between 1850 and 1830 Ma. The intimate association of magmatism, molybdenite, chalcopyrite and monazite at Estrela suggests an 1850 - 1830 Ma crystallisation age for the Estrelinha granite. Texturally older material within monazite (c. 1886 Ma) may be related to c. 1.88 Ga granitic intrusions in the region. A young hydrothermal event c. 1.73 may represent localised remobilisation and reprecipitation of monazite by halogen rich fluids. Thus Palaeoproterozoic magmatism, mineralisation and hydrothermal activity in Carajás is not limited to c. 1.88 Ga but extends from c. 1.9 to c. 1.7 Ga. These data and interpretations suggest that Cu ± Au metallogenesis in Carajás occurs in at least two metallogenic epochs, an Fe-oxide Cu-Au event of 2.7 - 2.5 Ga and a new Cu ± Au - (Ag-W-Sn-Mo-Bi) granite-related metallogenic epoch with a revised age of 1.9 - 1.7 Ga.