Algoma-type Neoproterozoic BIFs and related marbles in the Seridó Belt (NE Brazil): REE, C, O, Cr and Sr isotope evidence

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The Jucurutu Fm. in the Seridó Belt, NE Brazil, encompasses fine- to coarse-grained amphibolite-facies marbles, locally with cross-bedding and stromatolite structures. BIFs of three localities in this belt comprise itabirites and tremolite schist, and are overlain by marbles of the Jucurutu Formation. Diamictites of uncertain stratigrahic position exhibit clasts up to 0.6 m long and a fine-grained pelitic matrix.

δ13C stratigraphic pathways for carbonates show negative values at the base, followed upsection by positive values. At the Ferro do Bonito Mine, values as low as -12‰ in carbonates above the contact with BIF are followed by values ~ -5‰ and upsection, by positive values (+4 to +10‰).

δ13C values for overlying carbonates of the Jucurutu Fm. at Riacho Fundo, São João do Sabugi, and at Serra da Formiga are all positive, being contact zones between carbonates and BIFs covered by weathered material. 87Sr/86Sr values for carbonate rocks of the Jucurutu Fm. are mostly in the 0.7074-0.7075 interval, a ratio commonly observed in the late Cryogenian to the early Ediacaran.

BIFs exhibit Cr concentrations one magnitude higher than usual (85-400 ppm) and largely unfractionated Cr isotope composition, similar to average magmatic values (δ53Cr = -0.123 ± 0.102). They are characterized by δ53Cr values between -0.42 and -0.12 ‰, exhibit strongly positive Eu anomalies up to 3.1 and Ce anomalies (Ce/Ce*) ranging from -0.4 to 0.7. These BIFs possibly formed proximally to hydrothermal vents, in anoxic and acidic deep waters. Their deposition was followed by carbonates with “normal” Cr concentrations with slightly positively fractionated δ53Cr values and negative Ce/Ce* values between 0.4 and 0.5. These carbonates may represent post-glacial cap carbonates deposited in an anoxic to oxic shallow marine environment, as suggested by Ce/Ce* versus Pr/Pr* and Ce/Ce* versus Nd, although no glacial features occur in the underlying BIF.