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C AND Sr ISOTOPE VARIATIONS AND PALEOCEANOGRAPHIC CHANGES AS RECORDED IN THE LATE NEOPROTEROZOIC ARARAS CARBONATE PLATFORM, AMAZON CRATON, BRAZIL

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Isotopic variations of seawater have been used as paleoenvironmental markers in the chemostratigraphy of Neoproterozoic successions and for correlation among cratonic regions worldwide (Knoll et al. 1986, Derry et al. 1992, Narbonne et al. 1994, Kaufman et al. 1997, Saylor et al. 1998, Walter et al. 2000). In this paper, we present carbon ($\delta^{13}C$) and strontium ($^{87}Sr/^{86}Sr$) isotopic data for the carbonate rocks of the late Neoproterozoic Araras Group, exposed on the southern border of the Amazon craton and within the North Paraguay Belt. The Araras Group (Almeida 1964) is more than 600m thick, and overlies the diamictites of the Puga Formation (Fig.1). It consists of four formations (Mirassol d'Oeste, Guia, Serra do Quilombo and Nobres) summarized in a composite section representative of deep to shallow platform deposits that crop out around Mirassol d'Oeste and Cáceres, Mato Grosso, Brazil (Fig. 1).

The $\delta^{13}C$ values along the Araras carbonate succession are interpreted as representatives of the original ocean water chemistry ($\delta^{13}O$ > -8‰$_{PDB}$). It exhibits a monotonic trend with strongly depleted $\delta^{13}C$ values at the base and enriched compositions towards the top of the succession (Fig. 2). The deep platform deposits constitute two units of cap carbonate, the cap dolomite (Mirassol d'Oeste Formation) and cap limestone cementstone (Lower Guia Formation) that show depleted $\delta^{13}C$ values around -5‰$_{PDB}$ (Nogueira *et al.* 2003). The anoxic deep platform limestone succession (Guia Formation) that covers the cap succession presents a homogeneous behavior of ^{13}C isotopic curve, with values around -2.50 to -1‰. The overlying platform dolomitic succession (lower Serra do Quilombo Formation) shows slightly positive values (+0,14 to +0,26‰$_{PDB}$) in the shoreface to shallow platform deposits (uppermost part of the Serra do Quilombo Formation), and oscillates to slightly negative values in the peritidal facies (Nobres Formation). The $^{87}Sr/^{86}Sr$ follows the general trend of C isotopes, with values increasing upsection (Fig. 2).

Although the values reach 0.7082 at the base of the succession (Mirassol d'Oeste Formation), a clear increasing is verified upwards, reaching 0.7081 in the Guia and Serra do Quilombo formations, and 0.7088 in the Nobres Formation. Anomalous $\delta^{13}C$ values around -9‰ or higher, and the striking shifts in $^{87}Sr/^{86}Sr$ up to 0.7113 are observed close to discontinuity surfaces (Fig.2).

$^{87}Sr/^{86}Sr$ values above 0.7081 far from any key surface at well preserved cap carbonate rocks suggest that the Puga glaciation correlates to the younger event of the Varanger/Marinoan glaciation (~575-570 Ma). The increasing of the $^{87}Sr/^{86}Sr$ values upsection, as observed in the Araras Group, is similar to others Neoproterozoic successions in Namíbia and Canada, generally interpreted as post-glacial continental influx to the oceans related to the Brasilian-Pan-African orogeny (*e.g.* Hoffman et al. 1998, Jacobsen & Kauffman 1999).

Each strong negative isotope excursion is associated with a sequence boundary and/or a marine flooding surface and may provide an independent tool for estimating ancient eustatic sea-levels. The correlation $\delta^{13}C$ and the relative sea-level curves reinforces the idea of a close association between the paleoceanographic changes and the paleoenvironmental evolution of the Araras carbonate platform. Sharp shifts in the isotopic values record changes in the carbon cycle as well as of upwelling of deep water masses depleted in $\delta^{13}C$ at times of rapidly changing sea-level caused by post-Varanger/Marinoan deglaciation. The composite C and Sr isotope stratigraphy of the late Neoproterozoic Araras carbonate platform records the dramatic paleoceanographic changes that preceeded the irradiation of metazoans in Cambrian times.

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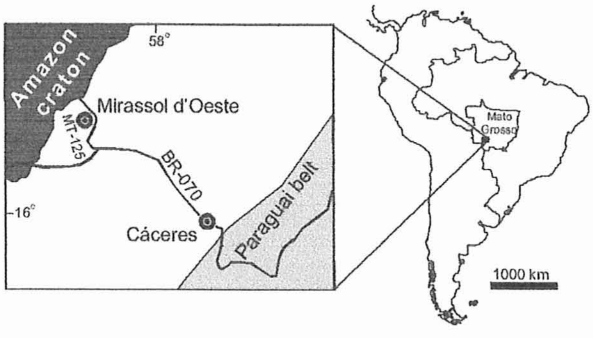

Figure 1. Location and geologic map.

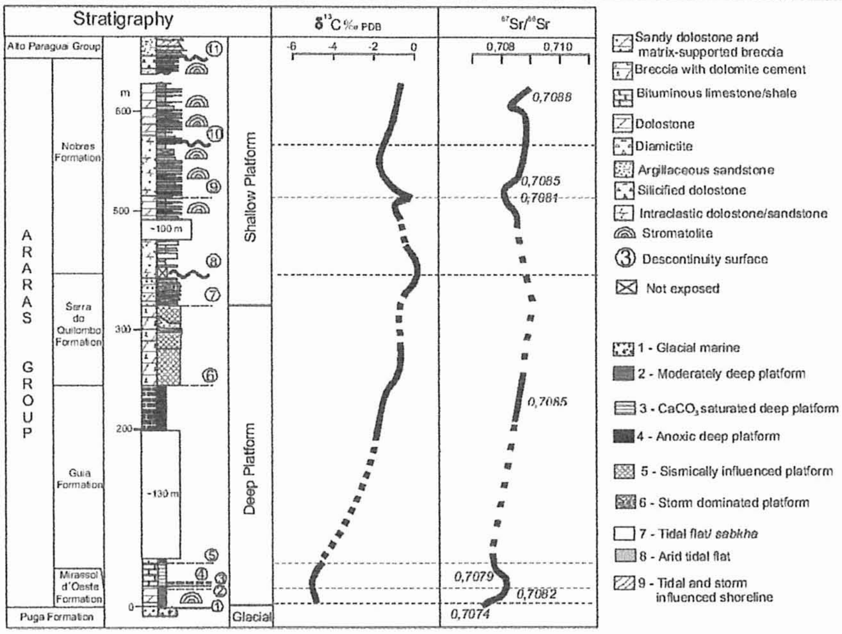

Figure 2. Lithostratigraphy, paleoenvironments and chemostratigraphy of Araras Group. The carbonate succession overly Varanger/Marinoan Puga diamictites. The values of $\delta^{13}C$ and $^{87}Sr/^{86}Sr$ are considered primary and representative of the Post-Varanger/Marinoan seawater.

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