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LATE NEOPROTEROZOIC CAP CARBONATE SUCCESSION FROM SOUTHEASTERN AMAZON CRATON, BRAZIL: SNOWBALL EARTH IN SOUTH AMERICA

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Neoproterozoic cap carbonates generally comprise pinkish dolostones with pronounced negative $\delta^{13}C$ signature and anomalous lithofacies that overlie glacial deposits with no evidence of a significant hiatus (Kennedy, 1996; Hoffman *et al.*, 1998; Hoffman & Schrag, 2002). South America is one of the last continents for which Neoproterozoic cap carbonates have yet to be precisely documented. Carbonates overlying diamictites are known in Neoproterozoic successions in central Brazil since the 50´s (Maciel, 1959; Almeida, 1964; Alvarenga & Trompette, 1992, among others), yet their descriptions are mainly lithological. Some authors have inferred the presence of cap carbonates in this region on the basis of aragonite crystal fans and negative carbon isotope values (Peryt *et al.*, 1990; Santos *et al.*, 2001).

Stratigraphic, sedimentological and isotopic analysis of the carbonate succession around Mirassol d´Oeste, Mato Grosso, Brazil, allowed us to characterize in detail a cap carbonate succession on the southeastern margin of the Amazon Craton. The cap overlies glaciogenic diamictites of the Puga Formation and comprises the basal portion of the Araras Group deposited below wave base on a carbonate platform. The Puga cap consists of two units separated by a transgressive erosional surface. The lower unit comprises moderately deep to shallow-water pinkish dolomudstone with stratiform fenestrate stromatolites, fenestrate planar lamination, ridge ("tepee-like structures"), and tubiform structures. The upper unit includes deep-water bituminous lime mudstones with terrigenous grains and subordinate shales. Alternating thin calcite crusts and lime mudstone laminae are commonly disrupted by calcite crystal fans (pseudomorphs after aragonite). Brecciated, faulted, and slumped limestone beds with multiple generations of cement indicate localized synsedimentary deformation.

The Puga cap exhibits depleted $d^{13}C$ values similar to other cap carbonates worldwide. (Jacobsen & Kauffman, 1999). $\delta^{13}C$ values around –5 ‰, but reaching almost –9 ‰ in carbonate mudstone, are associated with an anomalous shift in $^{87}Sr/^{86}Sr$ to values greater than 0.7010, consistent with a Varanger age. This age is corroborated by the microfossil assemblage (Hidalgo *et al.*, this volume) and new paleomagnetic data for the cap, which also indicate a low paleolatitude (24 °) for the Amazon Craton just after Puga glaciation (Trindade *et al.*, this volume). The similarities between the Puga cap and the mixed- and carbonate-dominated younger Neoproterozoic Ice Brook and Ghaub cap carbonates (of Canadá and Namíbia, respectively, Hoffman & Shrag, 2002) support correlation of these caps and have great paleogeographic significance. However, unlike other cap carbonates, the basal contact with diamictites exhibits soft-sediment deformation (load casts), providing unequivocal sedimentological evidence of rapid dolostone precipitation after ice melting. Although virtually all current models for cap carbonates admit that they formed in the immediate aftermath of deglaciation, this is the first concrete evidence in cap carbonates for the rapid transition from icehouse to extreme greenhouse conditions, thus lending considerable support to the snowball Earth model as postuled by Hoffman *et al.* (1998). The presence of this Neoproterozoic cap carbonate on the Amazon Craton extends the record of synchronous, global carbonate precipitation following Varanger glaciation to South America.

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COASTAL FACIES AND SANDSTONE COMPOSITION OF THE ÁGUAS CLARAS FORMATION (ARCHAEAN), CARAJÁS REGION, NORTHERN BRAZIL

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The siliciclastic Águas Claras Formation represents an unmetamorphosed Archaean cover sequence (2.6-2.7 Ga, Dias *et al.*, 1996; Mougeot *et al.*, 1996) widely distributed in the Carajás Strike-Slip System of the Carajás region which lies within the broad E-W-trending Late Archaean ductile Itacaiúnas Belt located on the southeastern margin of the Amazonian Craton. The Águas Claras Formation rests unconformably on the Grão-Pará and Igarapé Pojuca groups, composed of low-grade metamorphic sedimentary and volcanic rocks, and is overlain unconformably by arkosic sandstone and polymictic conglomerates of the Late Proterozoic Gorotire Formation (Lima & Pinheiro, 2001). The study of outcrops along the road to the Igarapé Bahia mine defined two lithostratigraphic units of the Águas Claras Formation: (i) Lower Member, composed of shales, siltstones and subordinate sandstones; and (ii) Upper Member, comprising mainly sandstones with local conglomerates. The facies of the Lower Member display shales and siltstone/sandstones with even-parallel lamination, ripple bedding in fine-grained sandstone as well as hummocky cross-stratification and micro-hummocky cross-lamination in intercalated fine-grained sandstone beds considered to be deposits of a periodically storm-influenced marine platform. The Upper Member was laid down in coastal (lower part) and fluvial (upper part) environments. The coastal facies include fine- to medium-grained sandstones with swaley and hummocky cross-stratification deposited under the influence of storm waves and fine- to coarse-grained sandstones with tidal bundles, low-angle cross-bedding and even-parallel bedding as well as fine-grained sandstone/mudstone rhythmites attributed to different tidally-dominated subenvironments protected from the open ocean. The uppermost fluvial deposits consist of conglomerates to coarse-grained sandstones with tabular and trough cross-bedding and even-parallel stratification related to bars and megaripples of a braided fluvial setting. The facies succession of the Águas Claras Formation records a shoreline progradation, and it appears that a tidally-influenced braid delta complex linked the marine environment with the fluvial system.