

New evidence for Sturtian Glaciation in Brazil based on Pb isotopes

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Craton-scale Neoproterozoic glacial deposits in central Brazil are overlain by a large (ca. 300.000 km²) carbonate platform. Despite many geochronological efforts the sedimentation age of both glacial rocks (Macaúbas, Jequitaí and Bebedouro units) and carbonates (Bambuí and Salitre units) is still debatable because these rocks were in part affected by ca. 600 Ma Brasiliano tectonism (Babinski et al., 1999).

Recent chemostratigraphic investigation (C, O, S and Sr isotopes) in some unusually textured carbonates (Sambra Quarry, Minas Gerais state; Peryt et al., 1990) from the lowermost unit of the Bambuí Group, suggests they are cap carbonates (Kaufman et al., 2001). They consist of seafloor cements, whose main isotopic and chemical characteristics are: (a) positive $\delta^{13}\text{C}$ excursion from the base at -4 to near 0‰ eight meters higher; values remain relatively constant above this zone; (b) rapid shift in $\delta^{18}\text{O}$ values from -10 to -6‰; values remain constant upwards; (c) organic matter is enriched in ^{13}C near the base ranging from ca. -18 to -20‰, resulting in carbon isotope fractionation between inorganic and organic phases of 12-14‰ (Kaufman, 2000); (d) sulfate concentrations range from 28 to 918 ppm, and $\delta^{34}\text{S}$ values rise steadily from near +22 to +46‰ in the shallow water, evaporitic carbonates; (e) high Sr and low Mn concentrations; (f) $^{87}\text{Sr}/^{86}\text{Sr}$ ratios are 0.7074, which are similar to those obtained for the Maieberg cap carbonate, Otavi Group, Namibia (Hoffman et al., 1998; Schrag et al., 1999), which is believed by these authors to be Sturtian in age.

Pb isotopic ratios were determined on five samples from the Sambra Quarry in the Center of Geochronology Research of the University of São Paulo. The $^{206}\text{Pb}/^{204}\text{Pb}$ ratios range from 18.8 to 32.5, $^{207}\text{Pb}/^{204}\text{Pb}$ from 15.65 to 16.54, and $^{208}\text{Pb}/^{204}\text{Pb}$ from 38.4 to 39.3. They yielded a Pb-Pb isochron age of 762 ± 29 Ma (2σ). This age is interpreted as the depositional time of these rocks and strengthens their correlation with the Maieberg carbonates, which are constrained to be younger than 758 ± 4 Ma (U-Pb zircon age; Hoffman et al., 1996). Our radiometric measurement on exceptionally preserved carbonates from the Sambra Quarry represents the best age constraint so far obtained for the Neoproterozoic glaciations in central Brazil, and support the idea of a widespread Sturtian glaciation in the São Francisco craton.

References

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Abstracts, p. 58