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ABSTRACTS

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ISOTOPIC COMPOSITION OF CARBONATES FROM LATE PROTEROZOIC SUCESSIONS IN BRAZIL AND THEIR STRATIGRAPHIC VARIATION

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Increasing number of studies using ^{13}C and $^{87}\text{Sr}/^{86}\text{Sr}$ for chemostratigraphic purposes have been reported in recent literature. Intra and interbasinal correlations among Precambrian sedimentary successions from many localities around the world (e.g., Morocco, Siberia, China, Greenland, Namibia) have been attempted. These correlations are based on the stratigraphic patterns of $^{13}\text{C}/^{12}\text{C}$ fluctuation in carbonates, which record secular variations of the Proterozoic sea water composition.

Isotope geochemistry of carbonate rocks from two Proterozoic sedimentary successions - Bambuí Group and Corumbá Group/Araras Formation - have been recently investigated in an attempt to refine the stratigraphy and better constrain the age of these successions. The carbonate-rich sections, which are the target of our study, belong to São Francisco Basin and Paraguai/Araguaia fold belt.

Bambuí Group exposed in the Central Brazil region is subdivided into Sete Lagoas, Serra de Santa Helena, Lagoa do Jacare and Serra da Saudade Formation. Bambuí Group, which overlies tillite-bearing Macaúbas Formation, is composed of two thick carbonate units intercalated with pelitic sections. In the basal Sete Lagoas Formation, thin dolomite and dolomitic limestones occur intercalated with limestone. Acritarchs of the genera *Kildnella*, *Vandalosphaeridium* and filamentous microfossils have been reported (Quadros, 1987), encompassing a time interval of Riphean to Vendian.

Corumbá Group and Araras Formation are chrono-correlated and are distributed in the west-central Brazil. Corumbá Group located on the southern branch of the Paraguai/Araguaia fold belt is subdivided into Cerradinho, Bocaina and Tamengo Formation. Araras Formation is exposed in the northern portion of the fold belt. Both units overlie tillite-bearing Puga Formation, which has been correlated to the glacial unit (Macaúbas Formation) of São Francisco Basin. Corumbá Group, contrary to Bambuí Group, is rich in fossil record. Metazoan *Cloudina lucianoi* and *Corumbela weneri*, metafiton and other microfossils, such as *Sphaerocongregus variabilis*, have been reported (Zaine & Fairchild, 1987). The uppermost Tamengo Formation where *Cloudina* occurs is the best representative section of Vendian in Brazil.

Whole rock $\delta^{13}\text{C}$ analyses have been performed in samples collected from three wells and outcrop exposures. In Bambuí Group samples, a shift from $\delta^{13}\text{C}$ lighter than +3‰ to values greater than +7‰ occurs between the basal Sete Lagoas Formation and the overlying units. $\delta^{13}\text{C}$ values of +7‰ to +12‰ are characteristic of the upper units, which encompass an interval of over 800 m in thickness. This large shift is preceded by a very steep increase of $\delta^{13}\text{C}$ values (-2‰ to +3‰) towards the top of Sete Lagoas Formation. The offset of 4‰ in $\delta^{13}\text{C}$ in samples located 250 km apart. It could represent a hiatus with a drastic change in sea water chemistry or erosional removal. In either case it represents a potential sequence boundary.

^{13}C values of Corumbá Group and Araras

Formation varies from -2‰ to +5‰. Similar to Bambuí Group, it also shows a negative excursion at the base. The enriched ^{13}C values, contrary to those obtained for Bambuí Group, is closer to the range of the widespread isotopic heavy carbonate composition typical of the Late Proterozoic. The interval of negative ^{13}C values could indicate a period of more limited organic productivity and/or organic carbon burial/preservation, which is compatible with epochs of worldwide glaciation. This interval in both carbonate successions directly overlies glacial influenced units (Macaúbas and Puga Formation).

Because $^{87}\text{Sr}/^{86}\text{Sr}$ ratios are very sensitive to terrigenous contribution and to diagenetic changes, only carbonate samples with calcite content higher than 95% and those devoid of clay minerals and feldspars have been considered for the present study. $^{87}\text{Sr}/^{86}\text{Sr}$ values varying from 0.70734 to 0.70759 have been obtained for Bambuí Group carbonates, whereas those in the ranges of 0.70848 to 0.70892 and of 0.70742 to 0.70802 are characteristic of the Tamengo Formation (Corumbá Group) and Araras Formation, respectively.

$^{87}\text{Sr}/^{86}\text{Sr}$ values of Tamengo Formation is consistent with latest Proterozoic strontium ratios, such as those found in Nama Group (Veizer et al., 1983). $^{87}\text{Sr}/^{86}\text{Sr}$ values of Bambuí Group, when compared to values compiled in Asmeron et al. (1991) and Derry et al. (1992), place them in the Early Vendian and possibly in the Riphean, since these ratios are only slightly higher than those obtained in Svalbard and East Greenland. Even the negative excursion at the base of the Bambuí Group, if related to glaciation, does not permit a better constrain in the age. There are two important glacial events during the Late Proterozoic - Sturtian and Varangian. However, if one accepts banded iron deposits to occur only associated with glacial events older than 650 Ma, then the age of the Bambuí Group is best placed in the Vendian.

REFERENCES

- Asmeron, Y., Jacobsen, S.B., Knoll, A.H., Butterfield, N.J. & Swett, K., 1991. Sr isotope variations in Late Precambrian seawater: implications for crustal evolution. *Geochim. Cosmochim. Acta* 55, p. 2883-2894.
- Derry, L.A., Kaufman, A., Jacobsen, S.B., 1992. Sedimentary cycling and environmental changes in the Late Proterozoic: evidence from stable and radiogenic isotopes. *Geochim. Cosmochim. Acta* 56, p. 1317-1329.
- Quadros, L.P., 1987. Ocorrências de Achritarchae (microfósseis marinhos) em sedimentos do Precambriano na área de Januária, MG, Brasil. *Bol. Geoc. Petrobrás*, v.1, p. 239.
- Veizer, J., Compston, W., Clauer, N. & Schidlowski, M., 1983. $^{87}\text{Sr}/^{86}\text{Sr}$ in Late Proterozoic carbonates: evidence for a "mantle event" at 900 Ma ago. *Geochim. Cosmochim. Acta* 47, p. 295-302.
- Zaine, M.F. & Fairchild, T.R., 1987. Novas considerações sobre os fósseis da Formação Tamengo, Grupo Corumbá, SW Brasil. *Anais 10 Congresso Brasileiro de Paleontologia*, v.2, p.797-807.