

BIOGEOCHEMISTRY OF NEOPROTEROZOIC SEDIMENTS FROM CORUMBA GROUP, SW-BRAZIL

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The Corumbá Group located in Mato Grosso do Sul (SW-Brazil) is composed of largely unmetamorphosed sedimentary rocks containing glacial and fossil records during the latest Proterozoic. Chemostratigraphic data from cap carbonate sequences above glaciogenic diamictite horizons in such sections are of great value for understanding the causes and effects of drastic changes in climate and chemistry of oceans and atmosphere during the Neoproterozoic era in SW-Gondwana. The Corumbá Group was deposited in a shallow epicontinental sea, and includes stromatolitic dolostones of the Bocaina Formation and dark organic rich limestones and marls of the Tamengo Formation overlain by gray siltstones of the Guaicurus Formation. The fossil assemblage in the Corumbá Group is composed of planktonic organic-walled microfossils (acritarchs), vendotaenids (*Eoholynia*, *Vendotaenia*) and benthonic skeletal fossils of possible metazoans (*Cloudina*, *Titanotheca*, *Corumbella*) representative of the Ediacara fauna (Gaucher *et al.*, 2003).

The lithologies of the Corumbá Group have been investigated by a combination of inorganic and organic geochemical methods, to determine major, trace and rare earth element (REE) concentrations, hydrocarbon distribution, and stable isotope ratios of carbonates ($\delta^{13}\text{C}_{\text{car}}$ and $\delta^{18}\text{O}_{\text{car}}$) and associated kerogen ($\delta^{13}\text{C}_{\text{ker}}$ and $\delta^{15}\text{N}_{\text{ker}}$). The chemostratigraphic profiles show important excursions (Fig. 1). The negative $\delta^{13}\text{C}_{\text{car}}$ values (as low as -5.7‰) from Bocaina dolostones increase by up to 10‰ in limestones of the Tamengo Formation. The marked negative $\delta^{13}\text{C}_{\text{car}}$ excursion is typical of cap carbonates worldwide, and reflects extreme changes in Neoproterozoic climate (Kaufman and Knoll, 1995). A second negative $\delta^{13}\text{C}$ excursion can be noted in the Tamengo limestones above the breccia horizon (from 5.2‰ to -2‰) (Fig. 1, Gaucher *et al.*, 2003). These negative $\delta^{13}\text{C}_{\text{car}}$ values mimic a decrease of the C_{org} content, probably reflecting a period of lower productivity and/or preservation of the organic matter. The $\delta^{13}\text{C}_{\text{ker}}$ values range from -26.4 to -22.8‰ , suggesting variations in the primary composition of organic matter as well as in the productivity rate during deposition. The $\delta^{15}\text{N}_{\text{ker}}$ values close to 0‰ (-3.3 to 3.1‰) suggest primary contribution of molecular nitrogen fixers, such as cyanobacteria. The stratigraphic changes of the redox sensitive

elements (Mn, Fe, U and V), REE concentrations, and positive Ce anomalies suggest two episodes of more reducing conditions in the depositional environment of Tamengo Formation (Fig. 1). These episodes coincide with positive excursions of C_{org} , $\delta^{13}C_{car}$ and negative excursion of C_{car} . The lowermost is associated with a slight increase of $\delta^{13}C_{ker}$ and $\Delta^{13}C_{car-ker}$, most probably reflecting a period of higher primary productivity.

All GC traces are dominated by a hump of unresolved complex mixture. The main resolvable compounds in the aliphatic hydrocarbon fraction are *n*-alkanes in the C_{12} to C_{30} range, maximizing at C_{26} with no odd-even predominance. Branched alkanes and acyclic isoprenoids are the main compounds eluting between the *n*-alkanes. The biomarker distributions (hopanes, steranes) in the fossiliferous (*Cloudina*) limestones of Tamengo Formation point to a marine environment of deposition with a diverse community of algal and bacterial organisms.

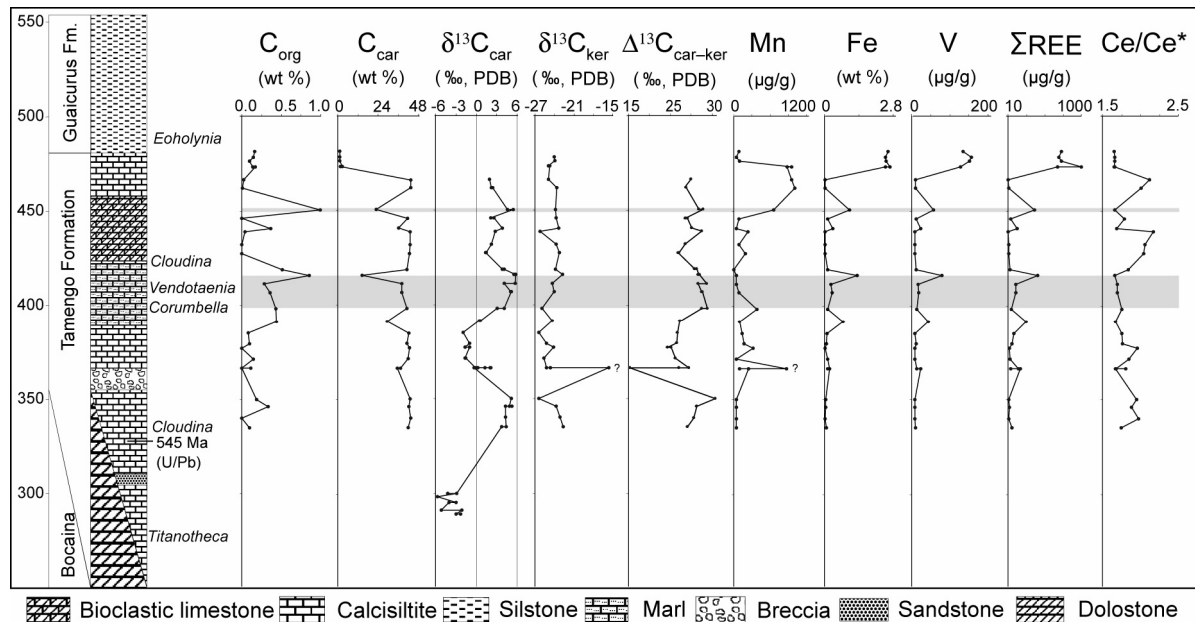


Figure 1. Stratigraphic column of the Corumbá Group with organic (C_{org}) and inorganic carbon contents (C_{car}), stable isotope composition of carbonates ($\delta^{13}C_{car}$) and kerogens ($\delta^{13}C_{ker}$), their differences ($\Delta^{13}C_{car-ker}$), contents of Σ REE and redox-sensitive elements (Mn, Fe, V), and Ce anomaly.

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