The isotope record of carbonates from an ancient epeiric sea: The case of the Bambuí Group, Brazil

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The Bambuí Group displays extensive carbonate-siliciclastic sediments in east-central Brazil. The unit is a geological record of an epeiric sea that flooded the São Francisco Craton in the inner part of Western Gondwana during the late Ediacaran. Two carbonate sections from the upper part of the basal unit of the group, the Sete Lagoas Formation, in the southeastern sector of the craton were sampled in high resolution for an isotope chemostratigraphy study. The goal was to evaluate the C, O and Sr isotope record of proximal and distal environments of the carbonate platform.

The proximal HV section (~48 m thick) located on the eastern margin of the craton exhibits dark gray, little impure carbonates. The $\delta^{13}C$ values range between 8.82 and 12.77‰, the $\delta^{18}O$ values vary between -10.05 and -6.95‰, with $^{87}Sr/^{86}Sr$ varying between 0.7074 and 0.7085, showing large fluctuations through the section. In contrast, the distal SL section (~46 m thick) is composed of pure dark gray carbonates showing very homogeneous $\delta^{13}C$ values ranging between 8.34 and 10.40‰, $\delta^{18}O$ values between -8.81 and -5.94‰, and $^{87}Sr/^{86}Sr$ ratios varying between 0.7074 and 0.7076. Carbonates from both sections are extremely enriched in Sr (> 1500 ppm).

The large fluctuations observed on the proximal areas suggest strong local controls on the isotope composition of the seawater, which can be accounted for riverine or submarine groundwater discharge. The distal sectors of the basin were not subject to such controls resulting in carbonates with homogeneous isotope profiles. However, the $^{87}Sr/^{86}Sr$ ratios of the SL section are less radiogenic than those expected for late Ediacaran period (~0.7085). This discrepancy can be explained by the lack of permanent connection of the Bambuí basin isotope pool with the global ocean due to restriction and/or inefficient circulation of the epeiric sea. This case challenges global correlations of carbonates deposited on ancient epicontinental basins based on isotope chemostratigraphy.