

## Pennsylvanian dolostones from the Piauí Formation, Parnaíba Basin, northern Brazil: stable isotopes (C, O) and taphonomy

F.R.D. Andrade, L.E. Anelli and L.V. Warren

*Instituto de Geociências, Universidade de São Paulo, Rua do Lago, 562, CEP 05508-080, São Paulo, SP, Brazil.*

The late Paleozoic-Triassic stratigraphic sequence of the Parnaíba Basin, northeastern Brazil, corresponds to a transgressive-regressive cycle delimited by strong unconformities, and comprises the lowermost Poti (Mississippian), Piauí (Pennsylvanian) and Sambaíba (Triassic) formations (Lima Filho, 1991). At the top of the Piauí Formation, the last record of a marine ingression in Parnaíba basin is represented by four fossiliferous dolostone beds with different paleontological, taphonomical and petrographic features that were selected for this study. These beds are named informally after the farms where they occur: Esperança, Mucambo, Meruoca, Contendas. The studied beds have been thoroughly dolomitized, but their carbon and oxygen stable isotopic composition still preserve at least in part their original sedimentary characteristics. The four dolomite beds have distinct but contiguous  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$ , indicating the possible existence of continuous paleoenvironmental gradients among them. Isotopic variations are consistent with paleontological data, as dolomites containing faunas of deeper water (Meruoca, Esperança) display more negative isotopic values than those bearing shallower water fossils (Mucambo, Contendas). The shallow water carbonates have higher  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  due to evaporation and preferential incorporation of  $^{12}\text{C}$  and  $^{16}\text{O}$  in the phytoplankton, while deeper water sediments have more negative isotopic ratios due to the oxidation of the organic matter at the bottom. Calculated temperatures of dolomitization based on  $\delta^{18}\text{O}$  for the dolomite beds are as follows: Contendas 30-41°C; Mucambo 37-49°C; Esperança 39-51°C; Meruoca 46-59°C. The amount of terrigenous minerals is variable between <5 and 30 vol.%. Feldspar predominates over quartz, and authigenic growth is responsible for at least part of the feldspar fraction, indicating the existence of K- and Na-rich brines during the diagenesis. Detritic feldspar suggests arid conditions, with physical weathering prevailing over chemical weathering, followed by aeolian transport of dust into the basin. Dolomitization took place under evaporitic conditions, whereas the carbonaceous sediments interacted with a hypersaline brine with high Mg/Ca, as Mg is relatively enhanced in respect to Ca due to chemical precipitation of gypsum and anhydrite, present in the evaporitic facies of the Parnaíba basin. The dolostones preserve a rich and diversified invertebrate Pennsylvanian fauna (Morrowan to Desmoinesian), comprising mainly bivalve mollusks, followed by gastropods and brachiopods, together with minor occurrences of cephalopods, trilobites and bryozoans (e.g. Anelli, 1999; Anelli et al., 2002; in press). The bivalve fauna is closely related to the fossil assemblage from the Pennsylvanian Itaituba Formation of the Amazonas Basin, Brazil, and shows affinities with late Paleozoic Andean faunas of the Cerro Prieto Formation and Tarma Group of Peru, the Caño Indio Formation of Venezuela and the Ixtaltepec Formation of Mexico. Quantitative and qualitative taphonomic analysis indicate that in the fossil beds in the Esperança (Nunes, 2003) and Mucambo dolostones reveal episodic burial of bivalves in life position. The fossil concentrations are densely packed, internally complex, with a multistory record of background and episodic processes, and in some cases showing high degrees of time-averaging and poor paleoecological resolution, except for the bivalves and inarticulated brachiopods preserved *in situ*.

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