Stable isotope composition of phosphatic fossils from the Upper Permian Teresina Formation of the Paraná Basin: Evidence for a freshwater influence

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The paleoenvironmental conditions for the deposition of Upper Permian siliciclastic deposits, such as the Corumbataí and stratigraphically equivalent Teresina Formations of the Paraná Basin, has remained controversial. Interpretations vary between fully marine, via high-energy, shallow-water, tidal or lagoonal deposition, to freshwater sedimentation. In order to address this problem, we have analyzed the oxygen and carbon isotope composition of phosphatic fossils within the Teresina Formation. Fossils analyzed include scales and teeth of Actinopterygians, scales of Acanthodii, as well as teeth and spines of Hybodontiformes and Xenacanthiformes sharks. $\delta^{18}O$ values of phosphate within the fossils range from 11.6 to 13.9‰ (VSMOW). Carbonate within the phosphate from two of the specimens has $\delta^{18}O_C$ values of 21.3 and 22.1‰ (VSMOW), and $\delta^{13}C$ values of -3.0 and -3.9‰ (PDB). By comparison to published $\delta^{18}O$ values for fully marine fossils from the Permian, these values are significantly lower and hence are compatible with a strong freshwater influence during deposition. The well-preserved equilibrium fractionation between carbonate and phosphate (about 8.5‰) in these fossils suggests limited influence of later diagenetic fluids.