Permian Radiolarian Faunal Variations Correlated to Stable Carbon and Oxygen Isotopes in the Lamar Limestone, Delaware Basin, West Texas: Implications for Radiolarian Paleoecology

Yuxi Jin, Paula J. Noble, and Simon R. Poulson

Department of Geological Sciences and Engineering, University of Nevada – Reno,
Mail Stop 172, 1664 N. Virginia St., Reno, Nevada 89557

ABSTRACT

The Lamar Limestone of West Texas is a basinal carbonate that contains a near continuous well-preserved late Guadalupian (Middle Permian) radiolarian record, and reveals eight marked faunal oscillations in a 9-m (~29 ft) interval. Radiolarian assemblages alternate between Albaillelid-dominated and sphaerellarian-dominated faunas. The relative abundance of *Follicucullus* (Albaillellaria), an important zone fossil, varies from nearly zero to as high as 90%. Geochemical proxies are being used to determine which environmental factors contribute to the faunal changes. Inorganic carbon and oxygen isotope results on 135 samples through the section show $\delta^{13}C_{carb}$ (Vienna Pee Dee Belemnite [VPDB]) values varying from -1.2 to +6.0 per mille (‰), and $\delta^{18}O$ (VPDB) values varying from -5.9 to -0.3 ‰. Lighter $\delta^{18}O$ values are correlated with higher concentrations of silt in the samples.

Correlation analysis indicates that the absolute abundance of total radiolarians (AAT, for 38 samples to date) in the dataset is negatively correlated with $\delta^{18}O$ values of the samples at the 5% significance level. Furthermore, this correlation is mainly due to the significant (at the 2% level) negative correlation between the absolute abundance of sphaerellarians and the $\delta^{18}O$ values. There is a less well developed correlation (significant at the 10% level) between the AAT and the $\delta^{13}C_{carb}$ values. Since carbonate $\delta^{18}O$ values are lighter in freshwater than in seawater, a negative excursion of $\delta^{18}O$ may represent a decline of paleosalinity through increased riverine input. Hence, these correlations may indicate that sphaerellarians are more sensitive to salinity changes than *Follicucullus*, and are more prosperous at lower salinities. However, due to the various perturbing factors on oxygen isotope values of old rocks, other potential proxies for paleosalinity such as Sr/Ca, Mg/Ca, and Ba/Ca will be analyzed in relationship to the radiolarian shifts in order to test further this hypothesis.

Jin, Y., P. J. Noble, and S. R. Poulson, 2008, Permian radiolarian faunal variations correlated to stable carbon and oxygen isotopes in the Lamar Limestone, Delaware Basin, West Texas: Implications for radiolarian paleoecology: Gulf Coast Association of Geological Societies Transactions, v. 58, p. 461.

Copyright © 2008, The Gulf Coast Association of Geological Societies. All Rights Reserved.