

Carbon isotopic chemostratigraphy of microbialite-bearing Lower Paleozoic carbonates of eastern Pennsylvania, USA

PEDRO J MARENCO¹ AND RACHEL W CLARK²

¹Department of Geology, Bryn Mawr College, Bryn Mawr,
PA, USA 19010, pmarenco@brynmawr.edu

²Department of Geology, Bryn Mawr College, Bryn Mawr,
PA, USA 19010

Lower Paleozoic carbonate exposures near Stonecliffe Recreation Area in Reading, Pennsylvania, USA have received relatively little study since they were mapped and described lithologically. Oolites, cm-scale crossbedding, and cm-scale limestone-dolostone couplets suggest a shallow-water, possibly evaporitic environment on the southern margin of Laurentia. The exposures contain multiple microbialite morphologies, including branching columnal and large domal mounds approximately one meter wide and half meter tall.

A lack of identifiable metazoan fossils has contributed to the difficulty in assigning a more precise age to these rocks. Based on lithology alone, the exposures have been mapped as the Upper Cambrian Maiden Creek Member of the Allentown Formation, however the precise position of this unit within the Cambrian is unknown.

Here we present results of a chemostratigraphic investigation of this exposure as a first step in better-resolving the age of this deposit. We collected carbonate samples at a resolution of approximately three meters, performed a petrographic analysis to screen for diagenesis, micro-drilled the best-preserved phases, and analyzed powders for $\delta^{13}\text{C}$ composition on a Picarro CRDS system. We also used ICP-MS to measure major and minor elemental abundances in an effort to better constrain diagenesis.

$\delta^{13}\text{C}$ results are largely between 0 and -2‰ VPDB throughout the fifty meters of studied section. The lower thirty meters exhibit a well-defined excursion from 0 to -2‰ VPDB with a subsequent return to values around 0‰ VPDB. The top twenty meters exhibit a poorly-defined excursion from 0 to -1‰ VPDB with a subsequent return to values around 0‰ VPDB. When compared to the Cambro-Ordovician $\delta^{13}\text{C}$ curve of Saltzman (2005), our data most closely align with the $\delta^{13}\text{C}$ data straddling the Middle Cambrian – Upper Cambrian boundary.