William F. Defliese of University of Michigan for his project: Evaluation of mass-47 Clumped Isotope Thermometry in Meteoritic Calcite Cements as a Proxy of Earth Surface Paleotemperatures.

A newly developed paleothermometer, mass-47 clumped isotopologues (^{17}CO_2), based on the temperature dependence of ^{13}C – ^{18}O bonds in carbonate, has been calibrated using biotic and experimentally precipitated carbonates. This paleothermometer provides a new reference for reconstructing Earth surface temperatures over the Phanerozoic, and is particularly exciting because it is independent of the δ^{13}C and δ^{18}O values of the precipitating fluid. This study will extend its application to naturally-formed diagenetic low-Mg calcites as a requisite to studying ancient sequences. Analysis of meteoric Pleistocene-aged cements, collected across a temperature gradient from Barbados, Florida and Bermuda, will test whether reasonable temperatures can be obtained from diagenetic phases, both cements and co-occurring allochems that have been replaced by low-Mg calcite. By combining mass-47 paleothermometry with bulk δ^{18}O composition, it will be possible to estimate δ^{18}O_{seawater}, and affirm either a secular change in seawater composition or a globally warm Paleozoic world.