

MicroCT scanning

Specimen scan(s) were loaded into CTAn software; individual specimen of interest was cropped out using the Region Of Interest tool to save individual specimen as sub-volumes. Loaded the specimen subvolume into Dataviewer software as a 3-D volume in orthogonal views (X, Y, Z). Rotated the specimen in either X, Y or Z position so that at least two orthogonal views display the axes of symmetry of the specimen. Save the volume as a Volume of Interest, in either the XY, XZ or YZ view depending on intended purpose. Re-oriented data can be loaded into CTAn software again for faster and easier processing of geometrical characteristics of each specimen.

Isotope measurements

Carbonate of the foraminiferal tests was dissolved with 0.1 ml anhydrous phosphoric acid while remaining bathed in PBS. The reaction occurred for 10 minutes in 12 ml septum-topped Exetainer off-line at 70C in an aluminum heating block of a GasBench II preparation device. The evolved CO₂ was captured in the Exetainer headspace while reacting and at the end of the reaction was immediately introduced into a Finnigan-MAT DeltaPlusXL continuous flow mass spectrometer using an automated GasBench II inlet system. Six pulses of sample gas were measured over 10 minutes and reported raw values are averages of all pulses. Reported precision is 2 standard deviations of the average.

The raw values were corrected for CO₂ contamination that presumably originates from the PBS solution. A linear relationship was found between the beam 44 voltage (a proxy for carbonate mass) and measured stable isotope ratios of variable masses of the NBS-19 standard measured interspersed with the foraminifera. The smallest NBS-19 beam 44 voltage was used as a detection limit for the foraminiferal isotope measurements; foraminifera with beam 44 voltages less than the smallest NBS-19 beam 44 voltage are not reported. The foraminiferal isotope ratios were corrected based on linear regressions of the relationship of beam 44 voltage and raw NBS-19 isotope ratios. Averages of the corrected NBS-19 isotope values (true value = 1.95 per mil) are 1.94 per mil for standards measured January 2018 and 1.98 per mil for standards measured April 2018. Details of the method are reported in Martin et al. (2010, *Paleoceanography*). Even with the corrections for CO₂ contamination from the PBS, the corrected isotope values are considerably lighter than previously measured seep foraminifera. These light values suggest that there may be additional contamination of CO₂ with isotope ratios that are sufficiently light to modify the measured (and corrected) isotope ratios without contributing enough mass to modify the relationship between the beam 44 voltage and NSB-19 isotope value. This source of this potential contaminant is unknown and has not been corrected.

TEM imaging

Foraminifera-bearing sediments were preserved and prepared using our standard methods of 3% glutaraldehyde in 0.1M cacodylate sodium salt, osmication, and embedding (Bernhard et al. 2000 *Nature*). Imaging occurred in the Central Microscopy Facility of the Marine Biological Laboratory (Woods Hole, MA).