

Paleotemperature of the Redwater Shale Member of the Sundance Formation Based on Oxygen Isotopes

The Redwater Shale Member of the Sundance Formation dates to the Oxfordian stage of the Late Jurassic period (~160 Ma), and represents a shallow inland sea. Outcrops of the Redwater shale contain marine invertebrate fossils which can be used to determine a paleotemperature of the sea. Belemnite and clam fossils were collected from four stratigraphic sections in central Wyoming. My hypothesis was that the temperatures calculated for the Sundance Sea should be warmer than those in other Jurassic marine environments, because it was shallow and at a low latitude. Determining a temperature from fossils relies on the ratio between oxygen isotopes in seawater, which is temperature dependent. The ratio is preserved in the calcite shells of fossils. Sample processing was done using mass spectrometry at the University of Rochester's stable isotope lab. The median temperature from the belemnites is 17.8 whereas the median temperature from the clams is 21.1. There is a higher variability for both the clams and belemnites compared to similar studies of other late Jurassic marine environments. The temperature difference between belemnites and clams might be because of a difference in oxygen fractionation in shell formation or because the belemnites were migrants rather than permanent inhabitants of the Sundance Sea. Median temperatures of the Redwater shale are higher than those in other studies, supporting the primary hypothesis.