OXYGEN ISOTOPES OF MIDDLE PENNSYLVANIAN APATITIC CONODONTS AS A POTENTIAL RECORD OF PENNSYLVANIAN GLACIAL ICE VOLUME VARIATIONS

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Oxygen isotopes ($\delta^{18}O$) from marine foraminiferal calcite have traditionally been used as climate proxies to determine Cenozoic seawater temperatures and/or glacial ice volumes. Deposits older than the Cenozoic have often been diagenetically altered making paleoclimate interpretations from $\delta^{18}O$ less reliable. Since the P-O bond of apatitic phosphate is stronger than the C-O bond in calcite, $\delta^{18}O$ studies from marine apatite should provide a more accurate means to study paleoclimatic change in pre-Cenozoic deposits. This study focuses on using apatitic conodonts (extinct Paleozoic marine microfossils) to determine changes in Middle Pennsylvanian glacier ice volumes. The Middle Pennsylvanian Gray Mesa Formation (Desmoinesian) from Mesa Sarca in central New Mexico is characterized by ~77 meter-scale, upward-shallowing carbonate cycles (3-6 m thick) which record orbitally forced (Milankovitch) glacio-eustatic sea-level changes. Cycle durations cluster around 70-140 ka, having been deposited during Gondwanan continental glaciation. Upward-shallowing trends are generally indicated by deeper subtidal skeletal wackestones and mudstones overlain by shallow subtidal skeletal wackestone/packstones. These are commonly capped by subaerial exposure features including pedogenic structures. Conodonts were collected from the base, middle, and top of two separate cycles; these cycle positions represent transgressive (interglacial) through regressive (glacial) depositional phases. Sample sets of 1-10 conodonts will be analyzed for $\delta^{18}O$ using laser ablation techniques (Sharp and Cerling, 1996). For initial ice volume change comparisons, the magnitude of isotopic shift from the bottom to the top of the Pennsylvanian cycles will be compared to the 1.0‰ to 1.5‰ shift recorded in Pleistocene marine glacial-interglacial cycles.


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