TEMPORAL CALIBRATION AND CORRELATION OF FOSSILIFEROUS NEOGENE STRATA IN FLORIDA, MARYLAND AND DELAWARE USING STRONTIUM ISOTOPES

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The Neogene sedimentary record of Florida and the Atlantic Coastal Plain contains some of the most richly fossiliferous strata known to paleontologists. While nonmarine fossils occur, marine mollusc shells representing shallow, continental shelf paleoenvironments are frequently the predominate biogenic component, often forming dense "shell beds." Historically, precise temporal correlations of these deposits have been hindered by a lack of age-diagnostic planktonic microfossils in these nearshore settings and an inability to correlate the relatively short stratigraphic sections to the Geomagnetic Polarity Timescale. This situation is improved dramatically through the application of strontium isotope chronostratigraphic techniques using unaltered mollusc shell $CaCO_3$. The $^{87}Sr/^{86}Sr$ isotopic ratio of seawater increased, often rapidly, throughout much of the Neogene, providing an important tool for age determination and correlation of fossiliferous sequences formed during this interval. In particular, the early and middle Miocene as well as the latest Pliocene and Pleistocene are especially amenable to this approach; consequently, fossiliferous horizons in both Miocene and Plio-Pleistocene strata were investigated.

Shelly sequences are abundant within such familiar Miocene units as the Calvert, Choptank, and St. Marys Formations in Maryland and the Kirkwood (or Calvert?) in Delaware where they have served as the basis for numerous paleontological investigations over the years. Faunal similarities between these units and fossiliferous strata in Florida such as the Hawthorn Group (e.g., Tampa Member of the Arcadia Formation) and the Chipola and Shoal River Formations, suggest similar depositional ages. We sought to verify this using Sr isotopes. In general, Sr isotopic ratios indicate strong correlations between Miocene marine molluscan faunas in Florida and the classic Chesapeake region. The fossiliferous Tampa Member (old Tampa Limestone) is most likely of late Oligocene age (ca. 25 Ma) and did not correlate with units sampled in Maryland. The Chipola and Shoal River Formations yielded ages of ca. 18-19 and 11-12 Ma, respectively, correlating nicely with portions of the Calvert and Choptank Formations, respectively. The St. Marys Formation is clearly younger (ca. 9-10 Ma). The Kirkwood Formation (or Calvert or its equivalent) in Delaware correlates well with Zone 3A of the Calvert (ca. 18 Ma) and the Chipola. Major hiatuses which correlate with regional and global sequence boundaries are indicated by the Sr results.

Sr isotopic investigations of mollusc shells from familiar Plio-Pleistocene units such as the Caloosahatchee, Nashua, Bermont, and Ft. Thompson of southern Florida (including their type localities), produced both predictable and unexpected results. All Ft. Thompson shells yielded $^{87}Sr/^{86}Sr$ isotopic ratios indicative of a Pleistocene age, as did most Bermont shells; however, several yielded older ages which calls into question conventional correlations of some well known sites. Sr isotopic values from shells collected at putative Caloosahatchee and Nashua localities produced similar age disparities, from early Pliocene to early Pleistocene, suggesting errors exist in conventional correlations. The value of the Sr isotopic approach in sorting-out Neogene biostratigraphy is clear, as is the need for additional analyses.