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Bosiljka Glumac[1] (1) Smith College, Northampton, MA

Stable Isotopes of Carbon as a Tool for High Resolution Stratigraphy of the Sauk II-Sauk III Sequence Boundary

Stable isotopes of carbon are a promising tool in stratigraphic studies of the boundary interval between the Sauk II and Sauk III sequences in North America. Carbonate strata deposited during the Steptoean (or late Dresbachian to early Franconian) stage of the Late Cambrian record a large, global positive carbon-isotope excursion. The maximum $\delta^{13}C$ values (+4 to +5 ‰ VPDB) are associated with indicators of a sea level fall, which produced a craton-wide unconformity or the Sauk II—Sauk III sequence boundary on the Laurentian continent. Large unconformities were not developed in all areas along the subsiding passive-continental margin of eastern Laurentia. Instead, in carbonate platform successions of the Appalachian region, the Sauk II—Sauk III interval is characterized by condensed sections and the presence of coarse-grained siliciclastic detritus. This conformable interval, correlative with the unconformity on the craton, can be interpreted as a sequence boundary zone. Such intervals, however, are commonly difficult to recognize and their regional correlation is hindered by the absence of large laterally extensive outcrops and by the lack of prominent biomarkers in geographically isolated, poorly exposed, highly dolomitized and structurally deformed sections. The record of the Steptoean positive carbon-isotope excursion provides a useful marker for the recognition and correlation of these intervals, whose timing can be determined from the consistent relationship between the carbon-isotope record and biostratigraphic indicators documented in fossiliferous successions elsewhere. Specific examples from the Upper Cambrian of the Appalachians will be discussed to illustrate the usefulness of carbon isotopes as chemostratigraphic markers for high resolution stratigraphy of poorly fossiliferous and extensively dolomitized strata of the Sauk sequence in the eastern United States.