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Recognizing the Albian-Cenomanian (OAE1d) sequence boundary using plant carbon isotopes: evidence for co-occurring sea-level regression

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Analysis of bulk sedimentary organic matter and charcoal from an Albian-Cenomanian fluvial-estuarine succession (Dakota Formation) at Rose Creek Pit (RCP), Nebraska, reveals a negative excursion of c. 3 per mil in late Albian strata (oceanic anoxic event 1d - OAE1d). Overlying Cenomanian strata have δ^{13}C values of -24 to -23 per mil that are similar to pre-excursion values. The absence of an intervening positive excursion (as exists in marine records of the Albian/Cenomanian boundary and OAE1d) likely results from a depositional hiatus. The corresponding positive δ^{13}C event and proposed depositional hiatus are concordant with a regionally identified stratigraphic sequence boundary in the Dakota Formation (D_2), as well as a major regressive phase throughout the globe at the Albian/Cenomanian boundary. Data from RCP confirm suggestions that some positive carbon-isotope excursions in the geologic record are coincident with regressive sea-level phases, and that OAEs do not always occur during transgressive phases. We estimate using isotopic correlation that the D_2 sequence boundary at RCP was on the order of 0.5 Myrs in duration. Several other sections including outcrop and cores have also been analyzed indicating that a similar duration is evident for the region. Therefore, interpretations of isotopic events and associated environmental phenomena, such as oceanic anoxic events, in the shallow-marine and terrestrial record may be influenced by stratigraphic incompleteness. Further investigation of terrestrial δ^{13}C records may be useful in recognizing and constraining sea level changes in the geologic record.