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Carbon isotope records of terrestrial organic matter and occurrence of planktonic foraminifera from the Albian Stage of Hokkaido, Japan: Ocean–atmosphere $\delta^{13}C$ trends and chronostratigraphic implications

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ABSTRACT

Carbon isotope compositions of sedimentary organic matter (average −24.1‰) from an Albian marine siliciclastic succession in Hokkaido, Japan, exhibit a distinct anomaly by ~+1.2‰ with a trifurcate shape across the Albian–Cenomanian boundary and two relatively small shifts (<+1‰) in the middle and upper Albian, respectively. The organic matter consist predominantly of woody materials with an insignificant degree of thermal alteration, judged from the visual and elemental characteristics of kerogen; the stratigraphic $\delta^{13}C_{org}$ fluctuations are independent of lithological or total organic carbon variations. Thus, the Hokkaido $\delta^{13}C_{org}$ profile is interpreted as representing the temporal $\delta^{13}C$ changes in whole C3 plant vegetation in the provenance of East Asia during Albian time. The patterns and amplitudes in $\delta^{13}C_{wood}$ values and their relationship with planktonic foraminiferal zones are conformable with coeval Tethyan $\delta^{13}C$ records of pelagic carbonates. This observation reinforces the view that $\delta^{13}C$ compositions of marine and terrestrial carbon reservoirs fluctuated simultaneously by the same amplitude within the ocean-atmosphere-biosphere system regardless of changes in such paleoenvironmental parameters as pCO_2. From a chemostratigraphic viewpoint, time-equivalent levels of Oceanic Anoxic Events and stage boundaries are constrained for the Hokkaido sections, allowing for the proposal of a detailed chronostratigraphic framework for future advanced paleoceanographic research in the mid-Cretaceous northwestern Pacific region.