Diagenetic and sedimentological controls on the composition of organic matter preserved in California Borderland Basin sediments

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ABSTRACT: Compound-specific radiocarbon (^{14}C) contents, stable carbon isotopes, and abundances of phytoplankton and vascular plant derived lipid biomarkers (alkenones and fatty acids) were obtained from Santa Barbara Basin and Santa Monica Basin sediments, along with radiocarbon contents of planktic foraminifera and total organic carbon. We investigated core-top and prebomb sediment intervals at sites from the flanks and depocenters of the basins deposited under contrasting bottom water oxygen concentrations. Bulk organic matter generally has the lowest radiocarbon levels of all sediment constituents measured, whereas planktic foraminifera tend to be the most radiocarbon enriched. Alkenones are systematically depleted in radiocarbon with respect to foraminifera. Short-chain (C_{14}, C_{16}, C_{18}) fatty acids decrease rapidly in absolute abundance and relative to longer-chain ($>C_{24}$) homologues from core-top to prebomb samples. The loss of short-chain fatty acids with depth is associated with ^{13}C depletion of short-chain fatty acids, indicating preferential preservation of terrestrially derived fatty acids. Short-chain fatty acids tend to be more ^{14}C-enriched relative to alkenones in core-top sediments, whereas longerchain homologues are generally the most radiocarbon depleted of the lipids studied here. Less refractory compounds (e.g., short-chain fatty acids) are thus enriched in radiocarbon with respect to more recalcitrant biomarkers (alkenones, long-chain fatty acids). The lower ^{14}C content of more refractory compounds reflects a larger proportion of laterally supplied, preaged material. Greater preservation of labile organic compounds observed at the depocenters than in flank sediments results in the presence of □younger□ biomarkers, underlining the important influence of selective degradation of labile compounds on their radiocarbon ages.

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