

New insights into the role of alkenone-mineral associations and hydrodynamic processes on $U^{k'}_{37}$ -temperatures recorded in marine sediments

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Alkenone-derived $U^{k'}_{37}$ is one of the most well-established proxies to reconstruct sea surface temperature (SST). Yet, decoupling of alkenone-SST from surface sediments with surface temperature of the water column overlying the depositional site is often observed in continental margins. Here, we address the influence of the interplay between alkenone-mineral relationships and differential hydrodynamic sorting of mineral particle sizes on the fate of sedimentary alkenones and derived proxy signals from these highly hydrodynamic regions. We analyze the concentration, radiocarbon (^{14}C) age and distribution (i.e., SST) of alkenones in bulk sediments and corresponding mineral grain-size fractions at 6 continental margins and 1 drift deposit. Alkenone ^{14}C age and SST reveal large temporal and temperature biases in bulk surface sediments at all the studied sites. Evaluation of alkenone abundance and ^{14}C age within grain-size sediment fractions indicates significant entrainment of older alkenones sorbed to the surface of sortable minerals. Alkenone concentration in size fractions normalized to the bulk sediment mass indicates the primary contribution of fine silt (2-10 μm) — and coarse silt (10-63 μm) to a lesser extent — to bulk sediments. The propensity to resuspension and translocation of particles within this size range has important implications for the paleoreconstruction of primary productivity and SST based on alkenone concentrations and distributions, as translocated alkenones might carry a different temperature signal than that at the depositional site if originated from distal locations. Warmer-than-instrumental SSTs are observed at most sites, being sand (> 63 μm) the fraction that carries the warmest signal. Selective degradation of the tri-unsaturated C_{37} alkenone attributed to the lower protection offered by larger minerals (lower mineral surface area) under oxic conditions is invoked to explain these results.