

EXPORT PRODUCTION DEPTH OF *EMILIANA HUXLEYI* IN THE GULF OF
CALIFORNIA: AN EVALUATION OF THE ALKENONE U^K₃₇ PALEOSST-PROXY

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CHAPTER 4 CONCLUSION

The depth of alkenone export production in the Gulf of California was constrained to ~20-30 m, which is well below the SML during the summer. As a consequence, SST is systematically underestimated by $U^{K'}_{37}$ collected in shallow sediment traps. The magnitude of the underestimate falls within the range of variability observed in most $U^{K'}_{37}$ - T relationships based on core-top samples [Muller *et al.* 1998; Conte *et al.* 2006]. However, the discrepancy between $U^{K'}_{37}$ -temperature recorded in sediment trap material and SST was smaller than expected based on the temperature gradient through the upper water column and the depth of alkenone export production. It appears that the physiological effect of growth under light limitation and its affect on $U^{K'}_{37}$ values helped to minimize the difference between $U^{K'}_{37}$ -temperature recorded in sediment trap material and SST. Therefore, relatively accurate SST estimates can be obtained from $U^{K'}_{37}$ measurements, even when the alkenone producing algae are exporting from depths below the SML (within $\sim\pm 3^\circ\text{C}$). On the other hand, recognition of the depth of export in ancient record could substantially improve paleotemperature estimates using the alkenone unsaturation index.

Concurrent measurements of integrated production in the water column and flux to shallow sediment traps allow for an estimate of the efficiency of alkenone export production. Efficiencies ranged from 9-34% and averaged ~20%. Assuming an ~50% loss due to limitations in the sediment trap collection method, it is estimated that the remaining ~60% of the alkenone production is

recycled through grazing or lost during transport (presumably to degradation or lateral transport). Unfortunately, the relatively large fraction of production that is not exported indicates that accurate estimates of paleoproduction could not be made by measuring alkenone accumulation rates in sediments.