An additional wrinkle in the Elderfield proxy development curve

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Total Organic Carbon (TOC), alkenone-derived $U^{k'}_{37}$, and foraminiferal $\delta^{18}O$ are commonly used to constrain past climate variability. These parameters are often applied as part of a multiproxy approach to well-dated sedimentary records. Typically, a single age-depth model, such as based on radiocarbon ages of planktonic foraminifera, is applied to all proxy records derived from the same core. However, in some cases ^{14}C ages of foraminifera, TOC and alkenones isolated from the same sediment layers differ significantly [e.g. 1]. These temporal offsets imply aliasing of corresponding proxy records, confounding interpretation of derived climatic signals. Moreover, since this asynchroneity among sedimentary phases has been linked with lateral transport processes, some signals may be non-local in origin.

In order to understand temporal relationships between proxies and hydrodynamic controls on their provenance and age, we examine ^{14}C and other characteristics of bulk sediment as well as specific grain size fractions, focusing on a well-characterized sediment core from the southwest Iberian margin. A strong ^{14}C age-grain size dependence is evident for organic carbon (OC). Furthermore, changing magnitude of temporal offsets among grain size fractions suggests climate-driven shifts in hydrodynamic forcing conditions.

These results underline the importance of considering hydrodynamic processes in interpretation of multiproxy records from ocean sediments, adding a further wrinkle to the Elderfield proxy development curve.

[1] Ohkouchi *et al*., (2002) *Science*, **298**, 1224-1227.