

Interactive comment on “Constraints on the applicability of the organic temperature proxies U_{37}^K , TEX₈₆ and LDI in the subpolar region around Iceland” by M. Rodrigo-Gámiz et al.

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General Comments:

In this work the authors investigated the applicability of U_{37}^K , TEX₈₆, and LDI to paleotemperature reconstructions around Iceland using filtered water, sediment trap, and surface sediment samples. The results suggest that while there is good agreement between proxy derived temperatures in surface sediment samples and seasonally averaged temperatures, there are large discrepancies between the proxy inferred temperatures in suspended and sinking particulate matter and in situ temperature, as has been seen previously. The authors contribute these discrepancies to production sea-

C467

sonality, diagenetic alteration, and/or lack of producing species. This work represents an important study of three widely used paleotemperature proxies in a climatically important setting in which previous work has shown them to have difficulty reproducing meaningful temperature estimates. It warrants publication after significant editing for clarity and fluency.

Specific comments:

In the Methods section, lines 14 to 24, the workup for the SPM filters is fairly complex and it is not clear to me why. Please expand slightly to explain your reasoning.

In figure two the authors show temperature reconstructions based on the different proxies. The concentration data for these samples is discussed in the results, but it would be good to see how the concentrations change between sampling stations and from year to year. Perhaps by adding a panel to figure two.

As a general comment the authors should take care in comparing discrete suspended particulate matter results from summer, or sediment trap results from only one year, to results based on surface sediments which likely reflect a decade or more of sedimentation. That said I appreciate how expensive and time consuming water-column work can be.

In their discussion of U_{37}^K , the authors suggest surface sediment based temperature estimates likely reflect summer temperatures as this is the time of maximum alkenone flux. This is supported by an XY plot of alkenone inferred temperature vs. summer mean temperature. However during summer, and time of maximum alkenone flux, U_{37}^K inferred sea surface temperatures are up to 4° colder than in situ temperature. This offset must complicate the interpretation of sedimentary U_{37}^K inferred sea surface temperatures as a summertime temperature signal. The temperature offsets seen in their sediment trap time series, U_{37}^K too warm in the winter and too cool in summer, has been seen previously [Harada et al., 2006; Lee et al., 2011; Prahl et al., 2001; Seki et al., 2007; Sikes et al., 2005; Yamamoto et al., 2007]. Please discuss within this

C468

context and reference appropriately.

Once the authors took into consideration an expanded depth habitat, and applied the proper calibration (TEX86L 0-200m), surface sediment derived temperature estimates were found to compare very well with mean annual or winter temperatures. This supports the interpretation that GDGT producers live throughout the water column and that TEX86 should be calibrated as such.

In all, the evidence presented by the authors supports a multi-proxy approach, particularly in troublesome environments like the high latitudes.

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