Supplementary for "Iberian Margin surface ocean cooling led freshening during Marine Isotope Stage 6 abrupt cooling events"

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Figure S1. Gas chromatographic results in two samples with low and high $C_{37:4}$%.

Figure S2. Sea surface temperature during MIS 6 in different site on the Iberian Margin

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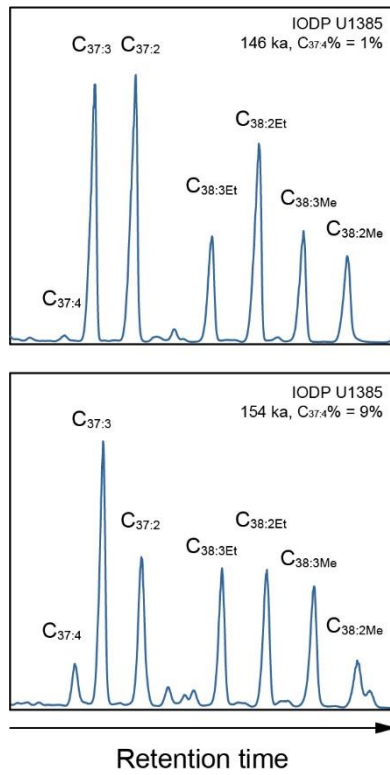Table S1. The endmember of mixing calculations in Figure 2.

Figure S1. Gas chromatographic results in two samples with low and high C$_{37:4}$%.
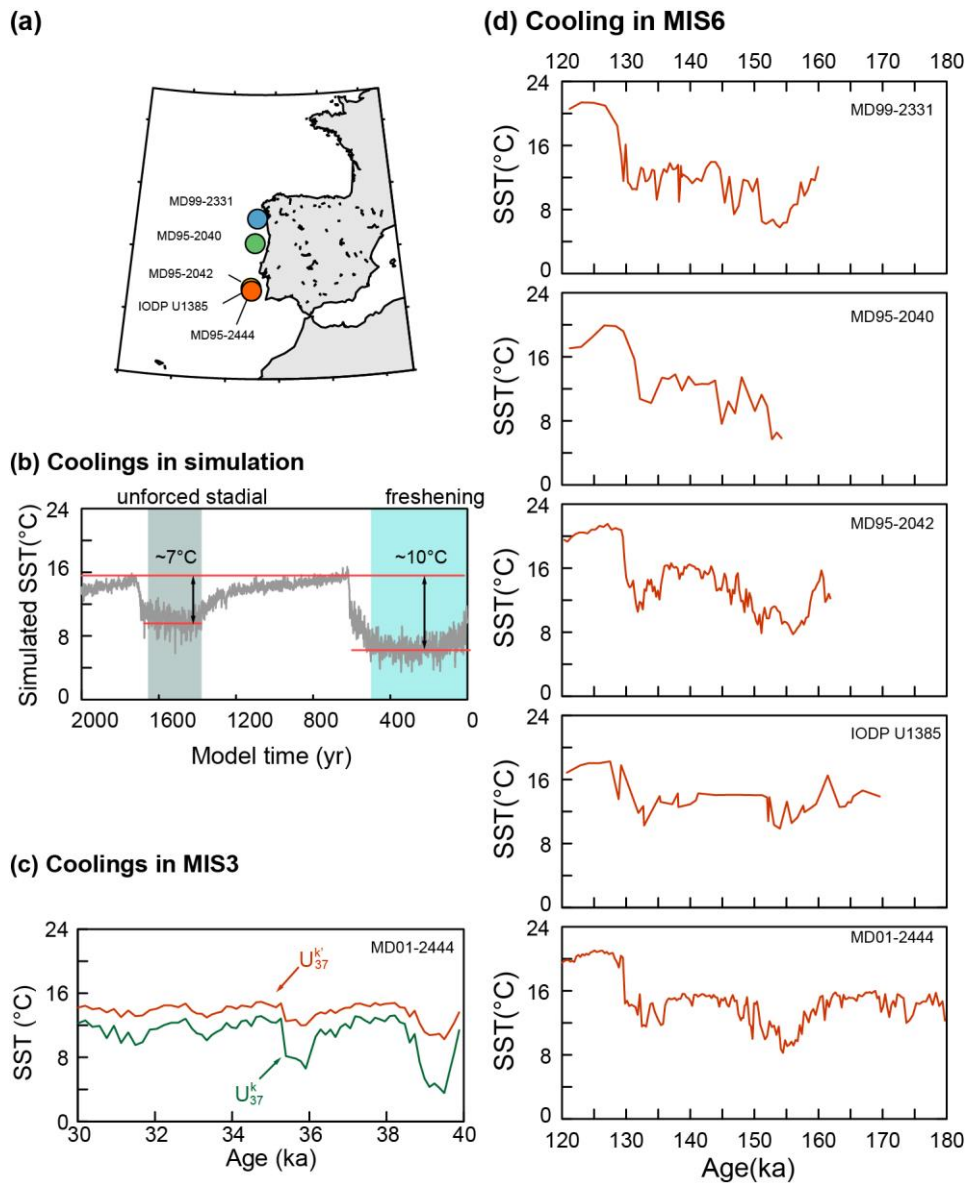
Figure S2. SST by $U^{k'}_{37}$ along the Iberian Margin. (a) Position of each site. (b) Simulated cooling events on the Iberian Margin (37.97°N, 10.2°W) with forced freshwater (light blue) and without freshwater (grey)[1]. (c) SST reconstructed by alkenone thermometers in the MIS 3. (d) The data in site MD99-2331, MD95-2040 and MD95-2042 are from [2]. The results in site IODP U1385 are from this study and [3]. Red lines are SST reconstructed by $U^{k'}_{37}$ with Bayesian calibration. Green lines are SST reconstructed by U^k_{37}[4].
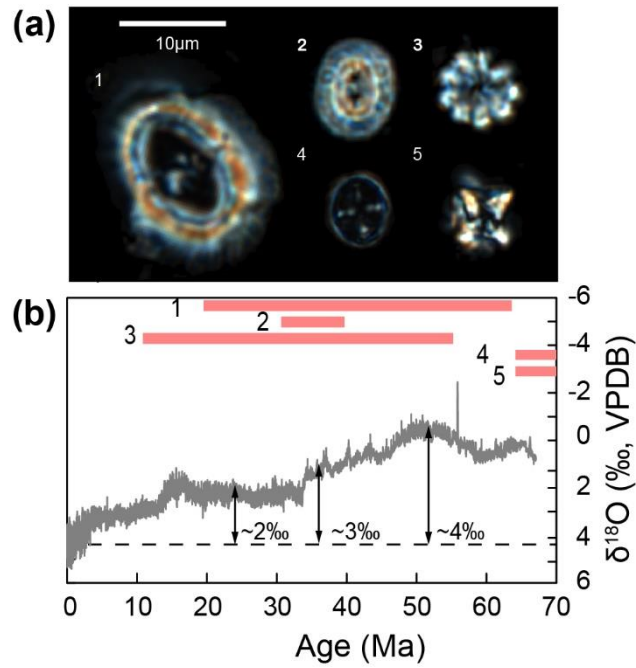
Figure S3. Reworked fossils and oxygen isotope of deep ocean. (a) fossils in circular polarized microscope. From 1 to 5: *Chiasmolithus* spp., *Reticulofenestra filewiczii, Discaster deflandrei, Chiastozygus stylesii* and *Micula staurophora*. **(b)** The stack of deep ocean (benthic foraminifera) oxygen isotope[5]. The pink bars represent the occurrence time of fossils (Nannotax3).
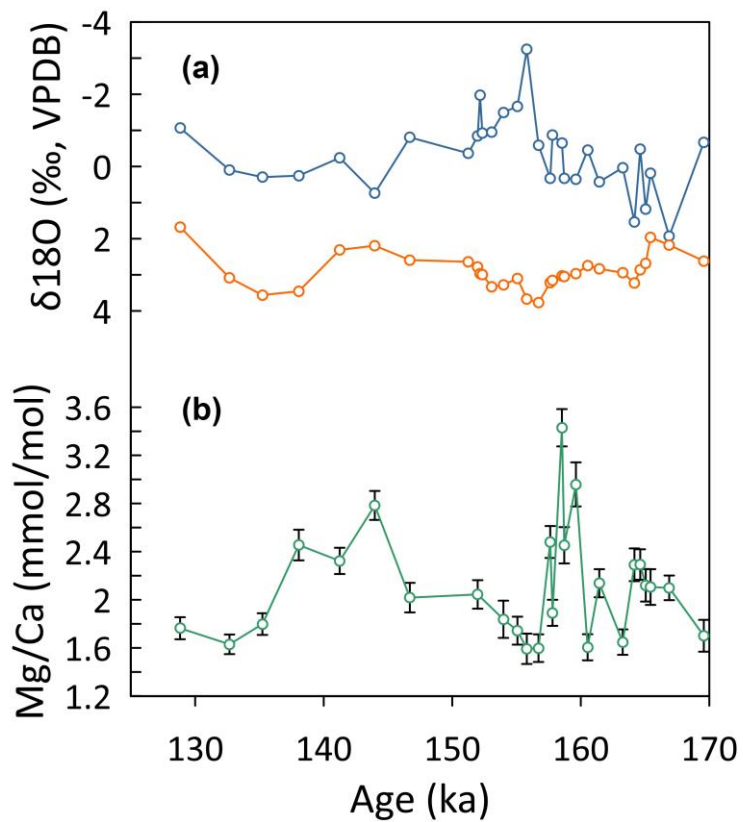
Figure S4. The oxygen isotope and Mg/Ca ratio measurements. (a) Oxygen isotope of planktonic foraminifera, *Globigerina bulloides* (orange dots) and fine fraction (<63μm, blue dots). **(b)** The Mg/Ca ratio of *G. bulloides*. The error bars represent the standard deviation of measurement.
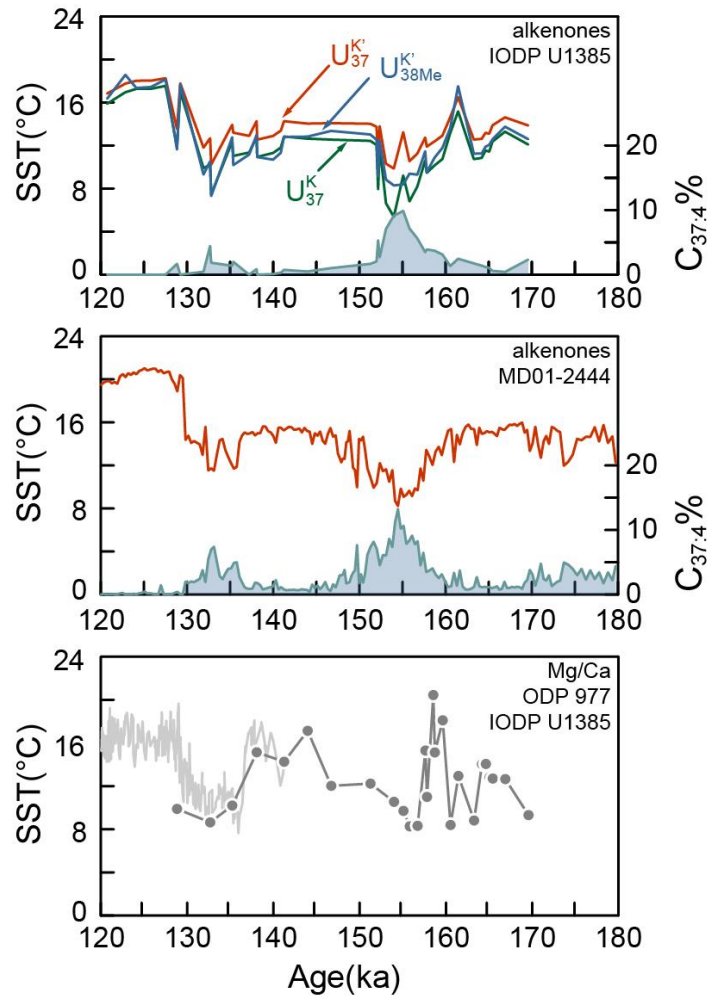
Figure S5. Comparison of alkenone-based SST and Mg/Ca SST on the Iberian Margin. Red lines are SST reconstructed by $U_{37}^{K\prime}$ with Bayesian calibration [6]. Green lines are SST reconstructed by U_{37}^{K} by Rosell-Melé [4]. Blue lines are SST reconstructed by $U_{38Me}^{K\prime}$ by Novak, et al. [7]. The shaded areas are $C_{37:4}$%. Grey lines are Mg/Ca of *G. bulloides* in site ODP 977 [8] and grey dots are new records in this study.
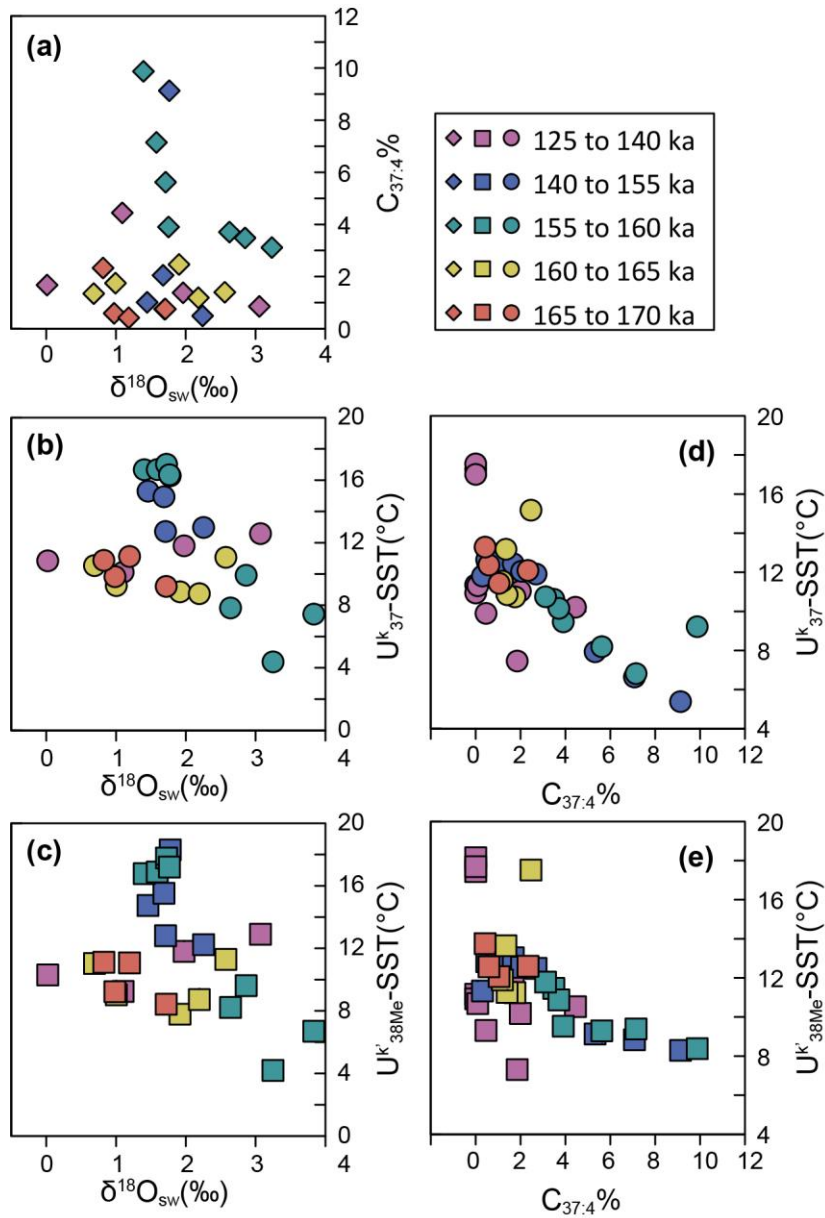
Figure S6. Cross plot among C$_{37:4}$%, δ^{18}O$_{sw}$ and alkenone-based SST. **(a)** Cross plot between C$_{37:4}$% and δ^{18}O$_{sw}$. **(b-e)** Cross plot among C$_{37:4}$%, δ^{18}O$_{sw}$ and SST estimated by U_{37}^{K} and $U_{38Me}^{K\prime}$. The squares and dots in b-e represent SST reconstructed by $U_{38Me}^{K\prime}$ and U_{37}^{K}, respectively.

Table S1. The endmember of mixing calculations in Figure 2.

	Group I		Group II		Group III warm		Group III cold	
	$C_{37:4}\%$	$C_{38ME}:C_{38ET}$	$C_{37:4}\%$	$C_{38ME}:C_{38ET}$	$C_{37:4}\%$	$C_{38ME}:C_{38ET}$	$C_{37:4}\%$	$C_{38ME}:C_{38ET}$
Figure 2c	40	0.2	--	--	0	0.3-2	--	--
Figure 2d	--	--	15-40	0	0	0.3-1	--	--
Figure 2e	--	--	--	--	0	0.3-1	10-40	2

Supplementary references

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