

# Surface ocean cooling led freshening on the Iberian Margin during the abrupt cooling event in Marine Isotope Stage 6

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The high-resolution paleoclimate records on the Iberian Margin provide an excellent archive to study the mechanism of abrupt climate events. Previous works on the Iberian Margin suggested that the surface cooling reconstructed by alkenone-unsaturated index coincided with surface water freshening reflected by the percentage of tetra-unsaturated alkenones ( $C_{37:4}\%$ ). However, there are still debates in the usage of  $C_{37:4}\%$  as a salinity proxy. Here in this work, we provide detailed alkenone measurements to trace the source of alkenone and seawater oxygen isotope estimations to reconstruct salinity on the Iberian Margin. The results indicate that the  $C_{37:4}\%$  should be employed as a temperature proxy, instead of indicating salinity. More importantly, during the abrupt climate events, the surface freshening did not always trigger the cooling, but sometimes happened in the middle of multiple-stage cooling events amplifying the temperature decrease.