



## The novel hydroxylated tetraether index RI-OH' as a sea surface temperature proxy for the period 160–50 ka BP off the Iberian Margin

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The stable oxygen isotope ratio ( $\delta^{18}\text{O}$ ) of planktic foraminifers, the  $\text{C}_{37}$  ketone unsaturation ratio ( $\text{U}^{\text{K}}_{37}$ ) and the TetraEther index of tetraethers consisting of 86 carbon atoms ( $\text{TEX}_{86}$ ) are three well-known examples of paleothermometric proxies. These established proxies are in the realism phase of the Elderfield proxy curve (2002 *Geochim. Cosmochim. Acta* 66 Suppl. 1, 213, DOI: 10.1016/S0016-7037(02)01009-8), which means that their advantages and shortcomings are relatively well evidenced, though not fully understood. By contrast, the Ring Index of hydroxylated tetraethers (RI-OH') is an example of novel paleothermometer. RI-OH' is still in the optimism phase, so its potential in paleothermometry remains to be further explored.

Here, we present new high-resolution temperature records over the interval 160–50 ka BP using four organic proxies (RI-OH', RI-OH,  $\text{TEX}_{86}$  and  $\text{U}^{\text{K}}_{37}$ ) from three deep-sea sediment cores located in a north-south transect along the Iberian Margin. RI-OH', RI-OH and  $\text{TEX}_{86}$  are based on LC-MS analyses of individual tetraethers with a two-column HPLC and improved mass spectrometric method. We analyzed all organic proxies in the same organic extracts to optimize proxy-proxy comparisons and phase relationship studies.

Our main results strengthen the optimism concerning the novel RI-OH' proxy for five reasons. 1/, the only existing global core-top calibration to date allows to reconstruct realistic sea surface temperature (SST) from RI-OH' in comparison to those derived from  $\text{U}^{\text{K}}_{37}$  and  $\text{TEX}_{86}$ . 2/, RI-OH' allows to establish plausible latitudinal temperature gradients, which are reasonably coherent with those based on  $\text{U}^{\text{K}}_{37}$  and  $\text{TEX}_{86}$ . 3/, RI-OH' records resemble those from established paleothermometers, especially  $\text{U}^{\text{K}}_{37}$  and  $\delta^{18}\text{O}$  of planktic foraminifers that better reflect SST than does  $\text{TEX}_{86}$ . 4/, RI-OH' responds to Dansgaard-Oeschger and Heinrich events as expected for North Atlantic SST proxies, which supports a direct relationship with Greenland temperature records. 5/, the outputs of a bipolar seesaw model forced with the RI-OH' record are well correlated with Antarctic paleotemperatures as expected from theoretical considerations.

Overall, our main findings support a continued interest on the novel hydroxylated tetraether paleothermometer RI-OH' so that it can progress along the Elderfield proxy curve. This work complements our first promising attempt based on a RI-OH record for a shallow core from the western Mediterranean Sea, located in a complex sedimentary setting much less favorable than

the Iberian Margin (Davtian et al., 2019 *Paleoceanography and Paleoclimatology* 34, 616–634, DOI: 10.1029/2018PA003452).