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Paleoenvironmental reconstructions of the Chilean margin using long chain diol proxies

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Long chain diols are biomarker lipids which occur ubiquitously in marine sediments. Recently, two new indices have been proposed based on the occurrence of long chain diols in marine sediments: the Long chain Diol Index (LDI; Rampen *et al.*, 2012) for sea surface temperature (SST) and the Diol Index for upwelling conditions (Willmott *et al.*, 2010). The LDI index is based on the distribution of C_{28} and C_{30} 1,13- and 1,15-diols, which shows good correlation with annual mean SST in marine surface sediments. The Diol Index is based on the relative amount of 1,14-diols versus 1,13-diols, as 1,14-diols are typical biomarkers for *Proboscia* diatoms, which are often associated with upwelling conditions. Therefore, the Diol Index is proposed as tracer for past upwelling conditions. Although they show promise, a lot of uncertainties still exist in the application of the proxies, stressing the need for more research. In particular, studies testing the applicability of the long chain diol proxies over geological time periods are scarce and limited to a few regions.

Here we tested the long chain diol proxies in the Chilean margin over the last 150 kyrs for ODP site 1234, which was sampled in high resolution ($\sim$ 2kyr). We generated LDI, TEX_{86} and $U^{K'}_{37}$ SST records. Since ODP 1234 is located within the coastal Peru-Chile upwelling system, we also tested the Diol Index as recorder of glacial-interglacial contrasts in upwelling.

The general trends of the three reconstructed SST records (TEX_{86}, $U^{K'}_{37}$ and LDI) agree well, and co-vary with those of the benthic stable oxygen isotope record for ODP Site 1234 (Heusser *et al.*, 2006), showing the two rapid deglaciations (Termination I and II) and the slow glacial build-ups. Whereas calculated temperatures are between $\sim$8 and 13˚C for the glacial periods, the temperatures for the interglacials are typically between $\sim$12 and 20˚C, with highest SSTs for the Eemian Interglacial (MIS 5e). The co-variation of the LDI temperature record with the other SST proxies and the benthic $\delta^{18}O$ record, implies that the LDI index reflects past SST in this region.

Elevated total organic carbon levels (2 vs. 1%) were observed during the interglacial periods as compared to the glacial periods, implying enhanced productivity during the interglacials. Correspondingly, two periods of high 1,14-diol concentration (*Proboscia* diatoms), and a high Diol Index, were observed in MIS 5, around 90 and 120 ka. Interestingly, in between these two periods, we observe a peak in loliolide concentration, which is a biomarker for diatoms. Additionally, diatom counts (Mix *et al.*, 2003) reveal a simultaneous peak abundance of the *Chaetoceros* spp. which is a typical upwelling species. Hence, these data reveal a succession of different diatom species blooming during periods of strong upwelling in the last interglacial.

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