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**Upper Water Column Structure During Marine Isotope Stage 11.3 and the Holocene on the Portuguese Margin**

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Most paleoceanographic studies have focused on reconstructing past surface water conditions by applying global trace metal calibrations of surface dwelling planktonic foraminifera (PF) from tropical - subtropical regions, and little attention has been paid to deep dwelling species and trace metal calibrations that include coastal upwelling samples. We have generated regional core-top PF trace element ratio (Mg/Ca, Ba/Ca, Cd/Ca) and stable isotope ( $\delta^{18}\text{O}$ ,  $\delta^{13}\text{C}$ ) calibrations for the Portuguese margin upper water column temperature and nutrient content. Three species with different depth habitats were explored in this seasonal upwelling region: *G. bulloides* an upper water column species; *G. ruber* (white), a surface dwelling species; and *G. inflata*, a deep dwelling species. Mg/Ca and  $\delta^{18}\text{O}$  values, and the derived sea surface temperature (SST), of the three PF species mirror seasonal temperatures in the water column as well as different depth habitats: (1) *G. ruber* (white) reflects surface conditions (~10 m water depth) in the warm winter-time Portugal Coastal Countercurrent (PCCC); (2) *G. inflata* indicates the winter mixed layer but is also present in the PCCC; (3) *G. bulloides* records the summer upwelling species lives in the upper 100 m water depth, but appears to migrate during the upwelling into waters closer to the surface (~10 m). The Ba/Ca, Cd/Ca and  $\delta^{13}\text{C}$  imply a complex relationship between nutrient tracers and the nutrient content of water masses on the Portuguese margin. Taken at face value, each of the nutrient proxies and the three foraminifera species seem to record different nutrient information. *G. bulloides* data, for example, suggest higher nutrients related with the upwelling waters whereas *G. inflata* imply higher nutrients at the base of the thermocline during winter. The insights gained from this study are being applied to reconstruct the upper water column structure on this seasonal upwelling margin during Marine Isotope Stage 11.3 and the Holocene, the most similar interglacial periods in terms of orbital parameters and

greenhouse gas concentrations, with the MD03-2699 core (recovered off Lisbon: 39° N; 10.7° W). Additionally, these shell geochemistry data are compared with alkenone abundance and derived SST data.

4924 Geochemical tracers

4936 Interglacial

4954 Sea surface temperature

4964 Upwelling (4279)

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