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A multiproxy approach to reconstruct carbon production and export at the Iberian margin

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Human activities have increased atmospheric CO_2 to unprecedented levels, affecting the climate and ocean systems and impacting life on Earth. The only natural tool for climate remediation is carbon sequestration, which is a consequence of primary production (PP). Half of the global net PP comes from marine photosynthesis, and substantially from the microscopic marine realm of coastal upwelling regions [1]. The West Iberian margin (part of the Canary Upwelling System) is ideal to study the impact of long-term climate variability on ocean carbon sequestration [2]. Previous studies showed PP and export production to be affected by climate change, while also revealed proxies' sensitivity to dissolution/preservation conditions [3]; possible decoupling between carbon fixation and sequestration [2]; and under-representation of subsurface and intermediate depth processes.

To evaluate the impact of climate change on the effectiveness of marine carbon sequestration, IRMAPEx project will characterize the Iberian margin subsurface and intermediate water conditions for time-slices of specific climatic boundary conditions since the Last Glacial Maximum. A multiproxy approach combines new with existing datasets to reconstruct the history of PP export by integrating: diatom accumulation rates, assemblages' composition and transfer function PP estimation [4]; planktonic foraminifera transfer functions [3]; Ba/Ca ratios on planktonic and benthic foraminifera species, and cold-water corals [5]; total organic carbon contents and mass accumulation rates.

Modern data for the NW Iberian margin suggest that coastal upwelling-related planktonic foraminifera species [6] register the increase in water Ba/Ca, accompanying the upwelling center. Elementary changes found between surface and deeper species may reflect carbon export along the water column. More data is needed to confirm this finding. Additionally, cold-water coral Ba/Ca preliminary data appears to record the expected glacial-interglacial PP export decrease to intermediate water depths. IRMAPEx integrative approach shall provide essential understanding of marine carbon fixation and sequestration processes over West Iberia.

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