



## **Centennial-scale variations in diatom productivity off Peru over the last 3000 years**

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The Peruvian coastal upwelling is one of the most productive systems in the global ocean, with important impacts on the carbon cycle. Primary productivity there displays strong variations at the inter-annual to decadal timescales. However, down-core investigations rarely reach sufficient temporal resolution to assess the response of productivity to climatic variations at these timescales beyond the instrumental and historical periods. We here analyzed diatom assemblages, sea-surface temperatures, nitrogen and organic carbon contents on a laminated sediment core from the Peruvian continental shelf to trace variations in regional productivity over the last 3000 years.

Our record provides evidence for different climatic and oceanic conditions with more humid and less productive conditions older than 2500 Cal years BP and drier and more productive conditions younger than 2500 Cal years BP. The last 2500 years also present much stronger centennial-scale variability with the occurrence of six intervals with higher total diatom abundances and stronger percentages in upwelling-related diatom species, representative of intensified productivity, congruent to lower percentages in benthic diatoms, indicative of reduced rainfall. These six periods were synchronous to intervals of enhanced Walker circulation, suggesting a strong imprint of the Pacific zonal circulation on productivity variations off Peru. Our record also demonstrates that SSTs did not vary in phase with productivity, arguing against the idea of regional SSTs controlled by the upwelling intensity, but were rather in agreement to SST records off southern Chile, suggesting that Peruvian SSTs variations were largely controlled by oceanic currents at southern high latitudes.