

RESPONSES OF SOUTH AMERICAN UPWELLING SYSTEMS TO GLOBAL AND LOCAL FORCINGS DURING THE QUATERNARY

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Upwelling systems are responsive to a variety of environmental factors, and the sediments deposited under them are recorders of the history of these factors. The elevated marine primary production that is associated with oceanic upwelling systems is a consequence of enhanced nutrient delivery to surface waters by water masses and by mixing. Nutrient delivery is responsive to both global and local processes. Changes in the strength and positions of the wind fields that drive Ekman vertical mixing are one of the variables that affect delivery of nutrients to the photic zone in upwelling systems. Times of higher and lower sea level can modify the positions of upwelling systems, particularly those parts in their relatively shallow nearshore areas. The nutrient content of the upwelled water masses is typically sensitive to local recycling and reutilization of the nutrients and to the histories of the water masses during their advection from sometimes distant sources. Finally, onshore climates are affected by upwelling and can also affect the nature of continental sediments delivered by rivers and winds to the upwelling areas. These multiple factors have experienced many changes since the beginning of the Quaternary. The initiation and intensification of northern hemisphere glacial-interglacial cycles since ~2.6 Ma created periodic repositioning of the Intertropical Convergence Zone, variations in eustatic sea level, and fluctuations in surface and intermediate water masses that affected the magnitude, intensity, and nutrient availability in upwelling systems in both the Atlantic and Pacific margins of South America. These changes are recorded in the sediments created in the upwelling areas, delivered from external sources, and deposited under them.