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ENSO-like variability from sedimentary records off Chile

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The eastern subtropical South Pacific Ocean constitutes one of the largest areas of natural air-sea exchange of CO2 to the atmosphere due to upwelling and biological activity. However, the impact of basin scale ENSO-like variability on coastal upwelling systems in the Peru-Chile Current and its relationship with global warming has not been thoroughly elucidated. We took advantage of a marine laminated sediment record (23S) covering the last centuries (1741-1998) to show an increase in the amplitude of the interdecadal ENSO-like conditions along with a 3-degree decrease in upwelling-induced sea surface temperature from the second half of the 19th century to the present. Sediment proxies and late twentieth century instrumental data are consistent with an intensification of the alongshore winds by increased land-sea thermal contrast during warm El Nino-like conditions resulting in enhanced coastal upwelling and biological production. There is a marked change (before and after 1870) in sedimentary d15N and D14C, sea surface temperature, and marine productivity, which is linked to a major shift in the oceanographic regime of the eastern South Pacific Ocean. This is also supported by the sedimentary record of d15N, TOC, and biogenic opal at mid-latitude and tropical coastal stations of Chile.

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