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Anthropogenic processing of dust affects the oxygen content of the North Pacific Ocean

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Observations from the last several decades show a significant expansion of the tropical Pacific oxygen minimum zone (OMZ). However, the underlying causes remain elusive, as the currently accepted effects of ocean warming and associated solubility decease cannot fully explain the observed oxygen trend. Here we show that anthropogenic pollution can change the pattern of biological productivity and oxygen trends consistent with observations in the tropics and extratropics. These effects are caused by the mobilization of iron in mineral dust by pollutants, where it is transported and deposited to the HNLC regions of the tropical pacific affecting primary productivity and oxygen consumption by bacterial respiration. In this study, it is shown that pollution-mobilized iron deposited to high latitude oceanic environments can profoundly impact subsurface oxygen and the extent of the OMZ through long-range oceanic transport. Together with the intensification of tropical upwelling since the 1990s associated with natural climate variability, our results can explain the expansion of the OMZ in the tropical Pacific in the late twentieth century. Unlike climate variability, however, anthropogenic pollution likely influences the long-term trends in marine biogeochemistry and further alters regional productivity and subsurface oxygen distributions with profound implications for marine habitats and nitrate inventory of the oceans.