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Coupled biogeochemical evidence for expanded ocean oxygen deficient zones during the Paleocene-Eocene Thermal Maximum

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The ocean has experienced substantial oxygen loss in recent decades, affecting marine ecosystems and fisheries. However, the future response of ocean deoxygenation to global warming remains a subject of debate. The history of ocean deoxygenation can offer important mechanistic insights into its future evolution. Of particular interest is the Paleocene-Eocene Thermal Maximum (PETM), where the magnitude of carbon emission is analogous to the RCP8.5 scenario. Recent studies suggest that the impact of global warming on ocean deoxygenation during the PETM is more complex than previously understood, highlighting the need for further investigation into the extent and spatial distribution of oxygen deficient zones (ODZs). Here, we present coupled records of foraminifera-bound nitrogen isotopes, marine barite sulfur isotopes, and ocean productivity from the South Atlantic. Integrated into an isotope-enabled ocean box model and an Earth system model cGENIE, these data suggest that global warming and productivity changes have driven an expansion of ODZs in the South Atlantic during the PETM.