

Corrosive Proto North Atlantic Deep Water Formation during the Paleocene-Eocene Thermal Maximum

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The Paleocene-Eocene Thermal Maximum, ~55 million years before present, was a period of rapid warming marked by a negative carbon isotope excursion and widespread dissolution of seafloor carbonate. These changes have been attributed to a massive release of carbon into the exogenic carbon cycle, and thus, the event provides an analog for future climate and environmental changes given the current anthropogenic CO₂ emissions. Previous attempts to constrain the amount of carbon released have produced widely diverging results, between 2000 and 10,000 gigatons carbon (GtC). Sediment records indicate that acidification of deep waters was generally more extensive and severe in the Atlantic and Caribbean regions, with more modest changes in the Southern and Pacific Oceans. Here we compare simulations integrated with the UVic Earth System Climate Model with reconstructions of temperature and dissolution to present a mechanism that might explain the observed spatial differences and to constrain the total mass of carbon released.