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Decrease of intermediate-water carbon storage recorded by biomarker proxies during the last deglacial

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Oceans, as a large reservoir of carbon, influence and regulate atmospheric CO_2. A reduction in deep-ocean carbon storage during the last deglacial period has been regarded as a driver of the increase in deglacial atmospheric pCO_2. However, there is a lack of knowledge regarding how carbon storage changes in intermediate water masses located between surface water and deep water. Here we show employed marine-produced branched glycerol dialkyl glycerol tetraethers to determine the pH in intermediate water in a western Pacific marginal sea. Our reconstruction revealed a progressive increase in pH in intermediate water, indicating a corresponding decrease in dissolved inorganic carbon (DIC) during the last deglaciation. An increase in deglacial pH aligns with a decrease in export productivity from the euphotic zone, indicating that biological pump-controlled, and thus East Asian monsoon-associated, carbon storage changes in intermediate waters. The estimated deglacial reduction in DIC in the unit volume of intermediate water is greater than that in the deep ocean, underscoring the critical function of intermediate water in carbon dynamics during the deglacial period.