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Pre-aged terrigenous organic carbon biases ocean ventilation-age reconstructions in the North Atlantic

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Over the last deglaciation, ventilation of ocean circulation has been key regulators of deep-sea carbon release, controlling climate change on centennial to millennial time scales. However, paleoceanographic reconstructions documenting changes in deep-ocean ventilation using 14C- foraminifera dating, may bear multidimensional explanations, obfuscating the roles of ocean ventilation played on climate evolution. Here, we show that previously inferred poorly ventilated conditions in the North Atlantic were linked to enhanced pre-aged organic carbon (OC) input during Heinrich Stadial 1 (HS1). The 14C age of sedimentary OC was approximately 13,345 ± 692 years older than the coeval foraminifera in the central North Atlantic during HS1, which is coupled to a ventilation age of 5,169 ± 660 years. Old OC was mainly of terrigenous origin and exported to the North Atlantic by ice-rafting. Remineralization of old terrigenous OC in the ocean may have contributed to, at least in part, the anomalously old ventilation ages reported for the high-latitude North Atlantic during HS1. This study provides a new organic geochemical explanation for anomalous deep-water ventilation 14C ages, and provides unique insights for global carbon cycle under extreme climatic events.