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Asymmetrical deep water mass distribution in the Atlantic Ocean during the Last Glacial Maximum

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Ocean circulation crucially affects global climate on glacial-interglacial timescales. In particular, changes in Atlantic overturning circulation are thought to have facilitated carbon storage in the deep ocean and lowered atmospheric CO_2 during the Last Glacial Maximum (LGM). Despite extensive effort, the LGM Atlantic circulation regime remains highly debated. Because deep waters formed in high-latitudes of the Atlantic have contrasting carbonate chemistries, a change in their relative configuration alters deep water acidity and, via benthic dissolution, sedimentary calcium carbonate content. Here, we reconstruct the water-mass structure of the deep LGM Atlantic (2,500-5,000 m) through re-assessing of sediment carbonate content data. We show that during the LGM, the deep Northwestern Atlantic was bathed in sluggish northern-sourced water (NSW). Meanwhile, relatively corrosive southern-sourced water (SSW) largely filled the deep Southwest Atlantic and penetrated into the Equatorial Eastern Atlantic through fracture zones. The Cape Basin was invaded by highly corrosive, Pacific-sourced, deep waters, whereas, the deep East Atlantic was occupied by great proportions of well saturated NSW. This reconstructed water-mass distribution for the LGM Atlantic places new constraints on past ocean circulation and, hence, global carbon cycle changes.