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Variable response of North Atlantic deep-sea benthic ecosystems to industrial-era climate change

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Traditionally, deep-sea ecosystems have been considered to be insulated from the effects of modern climate change. Yet, with the recognition of the importance of food supply from the surface ocean and deep-sea currents to sustaining these systems, the potential for rapid response of benthic systems to climate change is gaining increasing attention. North Atlantic benthic responses to past climate change have been well-documented using marine sediment cores on glacial-interglacial timescales, and ocean sediments have also begun to reveal that planktic species assemblages are already being influenced by global warming. However, very few ecological time-series exist for the deep ocean covering the Holocene-through-industrial era. Here, we use benthic and planktic foraminifera found in Northeast Atlantic (EN539-MC16-A/B and RAPID-17-5P), Northwest Atlantic (KNR158-4-10MC and KNR158-4-9GGC) and Labrador Sea (RAPID-35-25B and RAPID-35-14P) sediments to show that, in locations beneath areas of major North Atlantic surface water change, benthic ecosystems have also changed significantly over the industrial era relative to the Holocene. We find that the response of the benthos is dependent on changes in the surface ocean near to the study sites. Our work highlights the spatial heterogeneity of these benthic ecosystem changes and therefore the need for local-regional scale modelling and observations to better understand responses to deep-sea circulation changes and modern surface climate change.