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Impacts on sedimentological, biological and carbon regimes within Commonwealth Bay, Antarctica, following the 2010 Mertz Glacier calving event

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The dramatic calving of the Mertz Glacier Tongue in 2010, caused by the collision with the iceberg B09B, reshaped the configuration of the Mertz Polynya and Commonwealth Bay, off Adélie George V Land, and was implicated in precipitating a significant 'regime shift' in ocean circulation and sea ice dynamics that may persist for decades. Here we report a multidisciplinary study of marine sediment cores from Commonwealth Bay that record intense changes in the biological and sedimentological flux, which we investigate using regional ocean model simulations. Combined radiocarbon (14C), diatom, DNA, magnetic susceptibility, total organic carbon and geochemical analysis suggests that rates of sedimentation and organic flux have increased markedly since the grounding of B09B in Commonwealth Bay in 2010, reflecting an regional increase in carbon sequestration. Our data imply that the regional reconfiguration has led to a marked increase in carbon uptake in the area, supporting inferences from initial oceanographic surveys post calving. We suggest the enhanced carbon uptake and increased rate of sedimentation likely reflect enhanced biological productivity due to the extensive increase in sea ice, and a decrease in bottom currents associated with ocean circulation circulations changes. Our study records a unique 'natural experiment' allowing us to assess the impacts of marked change in sea ice and circulation in a region critical to climate and carbon dynamics, and demonstrates the dynamic role of the high-latitude Southern Ocean as a significant carbon sink.