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Simulating radiocarbon in the ocean model of the FAMOUS GCM

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Carbon isotopes are often utilised as proxies for palaeoceanographic circulation. However, discrepancies exist in the interpretation of isotopes in geological archives. A powerful approach for improving our understanding of palaeodata is to directly simulate multiple isotopic tracer fields within complex numerical models, thereby enabling model output to be compared directly to observations rather than the more uncertain climatic interpretations. We added the radioactive isotope ^{14}C to the ocean component of the FAMOUS atmosphere-ocean General Circulation Model to examine ocean circulation, the oceanic carbon cycle, and air-sea gas exchange. The abiotic ^{14}C tracer field is calculated based on air-sea gas exchange, advection and radioactive decay. A 10,000 year spin-up simulation was run to allow ^{14}C concentrations in the deep ocean to equilibrate. Here, we compare the modelled ^{14}C distributions in both the pre- and post-bomb era to published ^{14}C compilations. We also discuss methods for overcoming model drifts in the marine hydrological cycle and their impact on deep ocean circulation. The overall aim is to use the isotope-enabled model to investigate the ^{14}C fingerprint of different states of overturning circulation and to reach a better understanding of changes in ocean circulation and the carbon cycle at the Last Glacial Maximum (21,000 years ago) and during the last deglaciation (21,000-11,000 years ago).