



Marine radiocarbon reservoir age simulations for the past 50000 years

Martin Butzin, Peter Köhler, and Gerrit Lohmann

Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany (martin.butzin@awi.de)

We present simulations of marine radiocarbon reservoir ages using the ocean general circulation model LSG-HAMOCC2s, and evaluate the results with Marine13 raw data records. Our model considers various climatic background states. Radiocarbon cycle boundary conditions are atmospheric $\Delta^{14}\text{C}$ values according to IntCal13, a recent atmospheric CO_2 reconstruction, and spatially variable concentrations of dissolved inorganic carbon derived from marine carbon cycle simulations. Our model reasonably agrees with glacial marine $\Delta^{14}\text{C}$ records but indicates reservoir ages varying with time, different to the invariant reservoir age corrections applied to the observations and to Marine13. Modelled global-mean reservoir ages are in the range 400–800 years compared to the invariant Marine13 value of 405 years. Self-consistent simulations involving the Cariaco Basin record (which is the most continuous marine record contributing to IntCal13 for periods prior to about 30 kyears) amplify the temporal reservoir age variability with global-mean values of about 350–850 years, and improve the agreement with $\Delta^{14}\text{C}$ observations in some areas.