

Equatorial Pacific coral radiocarbon variations are strongly modulated by ENSO

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Corals have been shown to be good recorders of ocean surface radiocarbon concentration, and have been used to study the buildup and dissipation of the so-called "Bomb-Pulse" radiocarbon transient in the surface oceans. Sub-annual radiocarbon measurements of modern corals now reveal that the mixed layer $\Delta^{14}\text{C}$ can change significantly on both seasonal and inter-annual timescales. A high frequency radiocarbon record from Christmas Island in the equatorial Pacific (2°N , 157°W) shows post-bomb seasonal $\Delta^{14}\text{C}$ variations ranging between 10–30%. Pre-bomb-pulse seasonal $\Delta^{14}\text{C}$ variations at this site are 10–20%. These ^{14}C fluctuations exhibit strong

phase and amplitude modulation by ENSO. It is likely that the mixed-layer $\Delta^{14}\text{C}$ variations seen at Christmas Island are due mainly to ENSO-modulated changes in the fluxes of ^{14}C depleted carbon coming from the equatorial thermocline. Alternatively, horizontal advection of water masses with distinct isotopic composition may also be a factor. Because the Christmas Island ^{14}C record is strongly correlated with the Niño-3 index and the Southern oscillation index for the time frame studied, we expect to be able to recover long records of both the strength and frequency of ENSO from this and other Christmas Island corals.