A Coral Based Reconstruction of Atmospheric $\Delta^{14}C$ through the Mystery Interval (17.5 to 14.5 kyr BP)

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Reconstructions of the atmospheric radiocarbon concentration (IntCal09) from various archives exhibit a 190 part per-thousand (‰) decrease in $\Delta^{14}C$ during the Mystery Interval (17.5 to 14.5 kyr BP). It has been suggested that the decrease results from the injection of ^{14}C depleted intermediate depth waters during deglaciation.

We have generated a record of atmospheric $\Delta^{14}C$ for the Mystery Interval using radiocarbon and U-series dated Barbados fossil corals. A unique advantage to using the fossil coral archive is that both radiocarbon and calendar ages are obtained from the same sample, whereas atmospheric ^{14}C reconstructions generated from deep sea core microfossils require assigned calendar ages which are based on proxies correlated to ice cores or speleothems and are subject to proxy interpretations, correlation errors, and uncertainties in the imported chronologies. Unfortunately, small inaccuracies in the estimated calendar ages lead to large $\Delta^{14}C$ errors.

When compared to the consensus radiocarbon calibration curve (IntCal09), Barbados coral data are offset by as much as +800 years. We attribute the offsets in age (and calculated $\Delta^{14}C$) to inaccuracies in the chronology used to assign calendar year ages to Cariaco Basin sediments, which largely comprise the IntCal09 curve during the Mystery Interval.