

Toward a three-century reconstruction of climate variability from a slow-growing coral in the Western Province, Solomon Islands

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Climate variability in the west Pacific warm pool (WPWP), a major heat and moisture source to the atmosphere, is strongly influenced by the El Niño-Southern Oscillation (ENSO). Modeling work has suggested that multi-century scale reconstructions of ENSO variability from the tropical west Pacific may be necessary to fully characterize the nature of the ENSO system. Much of the previous coral-based climate studies have used the fast-growing coral genus *Porites*, although a few studies have used the long-lived, slow-growing coral genus *Diploastrea*. Here we present an oxygen isotope time series from a three century long *D. heliopora* coral from near Olasana Island, Western Province, Solomon Islands (WPSI, 8°07.92' S, 156°54.50' E), a location in the WPWP that experiences significant temperature and salinity anomalies during ENSO events. We first used a forward model to generate a pseudoproxy time series for the Olasana region, utilizing available gridded sea surface temperature (SST) and sea surface salinity (SSS) data spanning 1970-2007. There are strong correlations between predicted and measured coral $\delta^{18}\text{O}$, between both monthly ($r = 0.84$) and monthly anomaly ($r = 0.69$) records. These results demonstrate that the Olasana *D. heliopora* coral $\delta^{18}\text{O}$ record is a robust proxy of local surface ocean conditions. There is also a robust relationship between the Olasana $\delta^{18}\text{O}$ record and NINO3.4 index of ENSO activity during 1938-2007, which provides confidence that the Olasana $\delta^{18}\text{O}$ record can be used to characterize the ENSO state in this region back in time. Finally, we present results from near the core bottom (~1700 CE), which provide a first window into a gap of coral-based ENSO reconstructions in the immediate preindustrial (~1700-1850 CE).

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