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Influence of the Pacific Equatorial Undercurrent on Galápagos Seawater $\delta^{18}O$ Values

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Stable oxygen isotope ($\delta^{18}O$) values in the mixed layer of the ocean are a key water mass tracer that preserve information on both ocean circulation and atmospheric moisture balance. As seawater $\delta^{18}O$ values are recorded in carbonate marine archives, these values can provide information on past ocean and atmosphere variability. However, it is often difficult to disentangle ocean and atmosphere influences on seawater $\delta^{18}O$ values, partly because continuous time series of instrumental seawater $\delta^{18}O$ values are rare. Here we present one of the longest, continuous records of seawater $\delta^{18}O$ values available, from the Galápagos Archipelago. This weekly-resolved dataset spans nine years, from October 2012 to May 2021. Seawater $\delta^{18}O$ values are not strongly correlated with precipitation, evaporation, or Galápagos precipitation $\delta^{18}O$ values, nor local oceanic variables such as sea surface temperature, surface zonal and meridional current velocity, or 20°C isotherm depth. Seawater $\delta^{18}O$ values do faithfully track local mixed layer salinity as well as salinity along the eastern equatorial Pacific cold tongue. Strong correlations with salinity are also found at 50 m depth west of the archipelago, where the Pacific Equatorial Undercurrent is located. Zonal subsurface current velocity from 1°S-0°, 100-90°W, which tracks the strength of the Equatorial Undercurrent, is also strongly correlated with Galapagos seawater $\delta^{18}O$ values at a 1-month lag. Reconstructions of Galápagos surface seawater $\delta^{18}O$ values may thus provide a window into past variations in the strength of the Equatorial Undercurrent, an important influence on large-scale tropical Pacific climate and a key benchmark for climate and ocean model simulations.