Leaf Wax Hydrogen Isotopes as a Hydroclimate Proxy in the Tropical Pacific

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Hydrogen isotope ratios of sedimentary leaf waxes (δ 2 H Wax values) are increasingly used to reconstruct past hydroclimate. Here, we add δ 2 H Wax values from 19 lakes and four swamps on 15 tropical Pacific islands to an updated global compilation of published data from surface sediments and soils. Globally, there is a strong positive linear correlation between δ 2 H values of mean annual precipitation (δ 2 H P values) and the leaf waxes n -C 29 -alkane (R 2 = 0.74, n = 665) and n -C 28 -acid (R 2 = 0.74, n = 242). Tropical Pacific δ 2 H Wax values fall within the predicted range of values based on the global calibration, and the largest residuals from the global regression line are no greater than those observed elsewhere, despite large uncertainties in δ 2 H P values at some Pacific sites. However, tropical Pacific δ 2 H Wax values in isolation are not correlated with estimated δ 2 H P values from isoscapes or from isotope-enabled general circulation models. Palynological analyses from these same Pacific sediment samples suggest no systematic relationship between any particular type of pollen distribution and deviations from the global calibration line. Rather, the poor correlations observed in the tropical Pacific are likely a function of the small range of δ 2 H P values relative to the typical residuals around the global calibration line. Our results suggest that δ 2 H Wax values are currently most suitable for use in detecting large changes in precipitation in the tropical Pacific and elsewhere, but that ample room for improving this threshold exits in both improved understanding of δ 2 H variability in plants, as well as in precipitation.
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