

Chemical signatures of *Melaleuca*  
*quinquenervia* leaves as precipitation  
proxies

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## CHEMICAL SIGNATURES OF MELALEUCA QUINQUENERVIA LEAVES AS PRECIPITATION PROXIES

### MELALEUCA LEAVES AS PRECIPITATION PROXIES

#### ABSTRACT

The eastern coast of Australia is susceptible to variations caused by the El Niño-Southern Oscillation. The geological record in this region is therefore ideal for studying the history of El Niño variability. However, site-specific proxies for precipitation amounts are needed to examine El Niño in the geologic past.

Carbon isotope ratios of leaves and the average chain length of leaf-wax *n*-alkanes have the potential to act as proxies for past rainfall. Carbon isotope ratios respond to changes in water availability (Stewart *et al.* 1995; Korol *et al.* 1999; Cornic 2000; Van de Water *et al.* 2002). Average chain length of leaf wax *n*-alkanes has also been found to relate to climatic variables, including temperature, humidity and water availability (Tipple & Pagani 2013; F. McInerney pers. comm. 2014).

These two measures are used in this study to develop proxies for climate in modern *Melaleuca quinquenervia* leaves. We hypothesised that leaves in drier environments would have smaller discrimination values than wetter environments. We also hypothesised that average chain length of leaf wax *n*-alkanes in modern *Melaleuca quinquenervia* will show longer chain length distributions at drier sites.

The discrimination of modern leaves is positively correlated with precipitation and precipitation-evaporation for the previous four years at each site, and statistically significant negative linear correlations of average chain length with precipitation and precipitation-evaporation exist. The correlations have significance as modern calibrations for palaeoclimate proxies.

These calibrations have important geological applications to lake sediments preserving sub-fossil leaves of *Melaleuca quinquenervia*, including a known site at Swallow Lagoon on North Stradbroke Island and other identified sites of potential sub-fossil leaf preservation. The calibrations developed in this study have the potential to help quantify past precipitation and El Niño variation across the east coast of Australia.

#### KEYWORDS

Geochemistry, stable carbon isotopes, average chain length, *Melaleuca quinquenervia*, precipitation, proxies, palaeoclimate

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