

Variability of seawater pH over the past 550 years in the South China Sea

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The assessment of modern ocean acidification requires knowledge of the full range of natural variability in seawater pH. Here we splice together fossil-coral boron isotopic records from Xisha Islands in the central South China Sea to provide a continuous record of seawater pH that commences in AD1455. We applied micro-sublimation technique and MC-ICP-MS measurement to provide a low-blank and highly precise $\delta^{11}\text{B}$ measurement. Large variability in pre-industrial period was found. Spectral analysis of the reconstructed pH records showed significant periodicities at 11, 15.5, 22.5-26 and 175 years. While the frequencies of 15.5 and 22.5-26 years were associated with Pacific Decadal Oscillation (PDO), the stronger variability at 11 and 175 years bands were linked to solar activity. We proposed a physical mechanism behind it may be related to the coupling processes of the Asian monsoon, PDO and biogeochemical cycles in coral reef systems. Our record provides a natural baseline against which the long-term effects of ocean acidification on reef-water pH.