

A Late Quaternary Planktonic Foraminiferal Oxygen Isotope Record of the Banda Sea: Chronostratigraphy, Orbital Forcing, and Paleoceanographic Implications

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ABSTRACT

A detailed oxygen isotope time-scale based on planktonic foraminifera *Globigerinoides sacculifer* at site MD012380 in the Banda Sea was established for the past 820 kyrs by correlating the record to the astronomically tuned benthic oxygen isotope chronology of MD972143. Ages for marine isotope stratigraphic (MIS) events from 2.0 back to 21.1 were designated for this western tropical Pacific record.

Spectral analysis of the $\delta^{18}\text{O}$ time-series reveals distinct periodicities of 100, 41, and 23 kyrs, indicating strong orbital forcing, yet the power of each band varies through time. The time-series of three other paleo-proxies, namely, coarse fraction (CF), lightness of sediments and $\delta^{13}\text{C}$ of *Globigerinoides sacculifer*, were subjected to cross-spectral analyses against the oxygen isotope record. The Mid-Brunhes (MIS 13 - 10, 535 - 333 ka) divides the record into two time domains characterized by different spectral behaviors. Before the Mid-Brunhes, the analyzed proxies show relatively stronger powers at the 41-kyr band, and the coherence among various proxies is relatively high. After the Mid-Brunhes, 100-kyr periodicity becomes to dominate the $\delta^{18}\text{O}$ and coarse fraction records while coherence among the various proxies becomes weaker.

The spectral behaviors of the various paleo-proxies appear to vary through the late Quaternary and are fundamentally changed by the Mid-Brunhes event, suggesting the existence of an ever changing, internally complicated system of the Banda Sea under the influence of orbital forcing during the last 820 kyrs.

Key words: Age model, Oxygen isotope stratigraphy, Quaternary, Banda Sea

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1. INTRODUCTION

Fueled by constantly high sea-surface temperature (SST) of $> 28^\circ\text{C}$ (Yan et al. 1992), the Western Pacific Warm Pool (WPWP) is a key supplier of heat and moisture to the middle and high latitudes. Such a warm water pool appears to have existed in the tropical western Pacific for at least the past 1.75 million years although the SST might have lowered by as much as $\sim 4^\circ\text{C}$ during the glacial intervals (de Garidel-Thoron et al. 2005). Changes in north-south thermocline gradients of surface waters in the South China Sea as indicated by planktonic foraminiferal assemblages suggest that the WPWP was formed at about 4.0 - 3.2 Ma (Jian et al. 2006).

Mounting evidence accumulated in the past decade has ranked the WPWP a leading role in modulating global climatic changes at both millennial and orbital timescales (Cane 1998). The Banda Sea, one of the Indonesian marginal seas, situated in the center of the WPWP, plays a key role in inter-ocean exchange of thermocline waters between the Pacific and Indian Ocean (Gordon 1986). However, little is known for its role in the Quaternary climate change except for a short record derived from Core SHI 9014 (7.6 m in length) for the past 180 kyrs (Ahmad et al. 1995). To fill in this void, herein we present a high-resolution multiproxy record from a long piston core, MD012380 ($126^\circ 54.25\text{E}$, $05^\circ 45.64\text{S}$, Fig. 1), retrieved from the Banda Sea during 2001.

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