

History of the Leeuwin Current during the last 5 million years: Evidence from seawater Neodymium isotope variation

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The Leeuwin Current (LC), a shallow (<300 m depth) and narrow (<100 km width) eastern boundary warm current, transports relatively warm, less saline, and oligotrophic tropical seawater poleward along the Western Australian coastline. The water mass of the LC mainly originates from the Indonesian Throughflow (ITF), which connects the upper ocean circulation of the Pacific and Indian oceans and transports heat and freshwater through the Indonesian Gateway: consequently, a secular variation in strength and volume of the ITF relate closely to that of the LC. Since the ITF associated with the subsequent LC is regarded as one of the significant thermohaline circulations in the Southern Hemisphere, it is crucial to reconstruct a detailed history of these surface currents and to reveal their relationships to regional and global climates.

Orbital- to million-scale variations in the ITF with the subsequent LC during the last 5 Myr are assumed to be related to the tectonic history of the Indonesian seaway restriction/unrestriction and paleoceanographic conditions (e.g., glacial/deglacial sea-level change, El Niño/La Niño-like state of the Pacific Ocean, and variability of the Western Pacific Warm Pool). However, the detailed timing of major restriction/unrestriction of the ITF and the initiation and development of the Leeuwin Current are still unclear. The International Ocean Discovery Program (IODP) Expedition 356 recovered continuous Cenozoic (mainly the Miocene or younger) shallow-water carbonates, off northwestern Australia. Since some of the drilled sites are considered to be strongly influenced by the LC, Neodymium isotopes of foraminifers in the shallow-water carbonates are expected to record direct evidence of changes in the water mass along the Western Australian coastline. The objective of our research is to elucidate the long-term history of the Leeuwin Current during the last 5 Myr based on carbon, oxygen, and neodymium isotope records of foraminifers from IODP sites U1460 and U1463.

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