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Miocene to Recent Oceanographic and Climatic Histories from the Australian Northwest Shelf: Results from IODP Expedition 356

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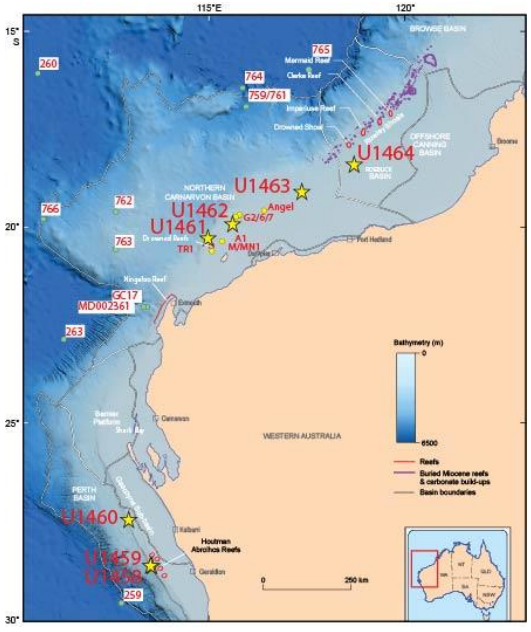
International Ocean Discovery Program (IODP) Expedition 356 (August-September 2015) drilled a latitudinal transect, across 10° latitude, of seven shelf and upper slope sites (Sites U1458-U1464) off Western Australia from the Perth Basin, through the Northern Carnarvon Basin, to the Roebuck Basin (Figure 1). *RV JOIDES Resolution* achieved continuously cored penetrations of up to 1.1 km. A major objective is to document the evolution of the Indonesian Throughflow (ITF), a critical component of global thermohaline circulation and a driver of the southward-flowing Leeuwin Current. These oceanic features have influenced the development of aridity in Australia and the genesis and variability of the Australian monsoon, as well as controlling reef growth along the west Australian margin. An additional objective is to obtain improved subsidence histories along the transect to evaluate the contribution of large-scale geodynamic processes, such as dynamic topography induced by mantle anomalies, on the region's sedimentary systems.



Biostratigraphic, sedimentological and geochemical analyses, coupled with an array of downhole measurements, provide comprehensive Neogene shelf and slope stratigraphic records. The sediments recovered are predominantly carbonates, but a siliciclastic component is also present at varying concentrations. Wireline logs of potassium and uranium content may be proxies for fluvial and aeolian inputs, respectively. Such proxies, together with sedimentological evidence of arid conditions, have proven particularly valuable for tracking transitions between arid and humid climates since the Middle Miocene Climate Optimum, culminating in the onset of the modern Australian monsoon. These climatic transitions are linked to the development of the Antarctic ice sheet as well as changes in Indian Ocean

Figure 1. Locations of IODP Sites U1458-U1464.

circulation and restriction of the ITF. In addition, the discovery by Expedition 356 of the oldest Quaternary ooids in the Indo-Pacific region provides information on paleobathymetry and other conditions necessary for ooid formation.

Ongoing research will evaluate biogeographic and water temperature (using multi-proxy organic geochemistry and Mg/Ca) evidence of ITF connectivity, produce high-resolution stable isotopic and sediment compositional records, and quantify the unusually high subsidence rates observed at several sites, which are probably linked to dynamic topography. Integration of core and seismic data will allow documentation of the onset of post-Miocene reef and carbonate platform development, previously poorly constrained in this region.