

The Lord Howe Rise (LHR) Drilling Project: tectonics, paleoclimate and deep life on the LHR high-latitude continental ribbon

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The Lord Howe Rise (LHR) is an elongate ribbon of submerged and extended continental crust that separated from Australia during the Late Cretaceous. Because the LHR is concealed beneath the Tasman Sea in water depths of 1000–3000 m, current knowledge of LHR geology based only on sparse geophysical data, few dredge samples, and sparse shallow (<600 m below-seafloor) drilling into Cenozoic and latest Cretaceous pelagic sediments (Deep Sea Drilling Project DSDP Leg 21 Sites 207 and 208).

Existing data provide a broad understanding of the LHR's crustal structure, sedimentary basin architecture and resource potential. However, building more detailed knowledge of LHR geology, and understanding the geological evolution of the southwest Pacific more broadly, requires drilling into rocks that record the >100-million-year geological, tectonic and climatic history of the region. To this end, Geoscience Australia (GA) and the Japan Agency for Marine Earth Science and Technology (JAMSTEC) are leading an international effort to drill a deep (up to 3500 m below the seafloor) stratigraphic hole through a LHR basin that will recover Mesozoic sediments and potentially basement rocks.

A proposal for the drilling using the JAMSTEC drilling vessel CHIKYU was submitted to the International Ocean Discovery Program (IODP) in October 2015 (Proposal 871-CPP). The objectives outlined in this proposal are to: 1) define the role and importance of "continental crustal ribbons", like the LHR, in plate tectonic cycles and continental evolution; 2) recover new southern high-latitude data in the southwest Pacific to better constrain Cretaceous paleoclimate, and linked changes in ocean biogeochemistry; and 3) test fundamental evolutionary concepts for sub-seafloor microbial life over a 100-million-year timeframe. Drilling vessel Chikyu is the only platform that is capable to drill through the great depth at LHR, to accomplish this project.

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