

# Paper Number: 1710

## Lord Howe Rise deep stratigraphic drilling: tectonics, climate and ancient life

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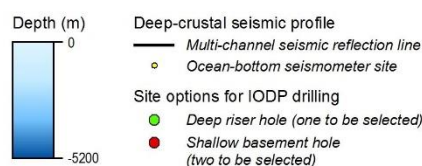
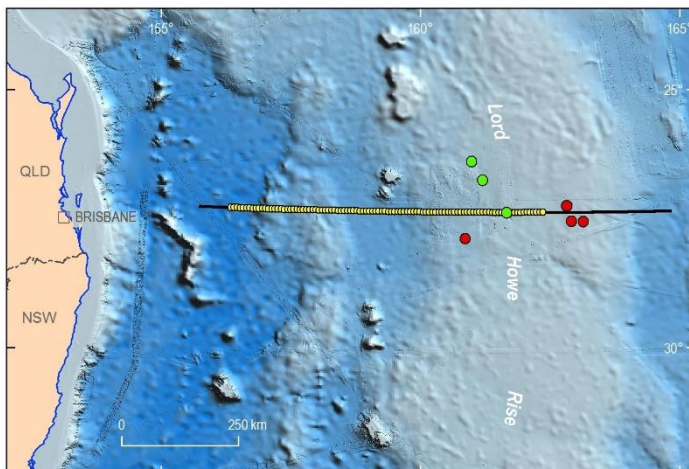
The Lord Howe Rise (LHR) is an elongate ribbon of submerged and extended continental crust that separated from Australia during the Late Cretaceous. The LHR is concealed beneath the Tasman Sea in water depths of 1000–3000 m (Figure 1), so current knowledge of LHR geology is based only on widely-distributed marine and satellite geophysical data, limited dredge samples, and sparse shallow (<600 m below-seafloor) drilling into Cenozoic pelagic sediments.

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 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 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 rift basin that will core Cretaceous and older sediments and potentially basement rocks. Two shallow holes into basement horst blocks may also be drilled.

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 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.

If funded, the stratigraphic drilling is planned for late 2018 or early 2019. Preparations for drilling include a deep seismic survey conducted earlier in 2016 that acquired deep-crustal 2D seismic reflection and refraction data along an east–west transect across the LHR and high-resolution 2D



15-9388-1

seismic data at the sites being considered for drilling (Figure 1). A second survey in 2017 will acquire the geotechnical data necessary to successfully drill a deep stratigraphic well. This detailed site survey will acquire high-resolution seabed and shallow sub-seafloor data, shallow sediment cores (<60 m below-seafloor) and underwater video.

*Figure 1: Map showing the sites being considered for drilling as part of IODP proposal 871-CPP and the deep-crustal seismic profile.*

