# IODP deep riser stratigraphic drilling in the southwest Pacific: tectonics, climate and ancient life on the Lord Howe Rise continental ribbon

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The Lord Howe Rise is a ribbon of submerged and extended continental crust that separated from Australia during the Late Cretaceous. The Lord Howe Rise is remote and concealed beneath the Tasman Sea in water depths of 1000–3000 m, therefore current knowledge of Lord Howe Rise geology is based on sparse shallow (<600 m below-seafloor) DSDP drilling into Cenozoic pelagic sediments, isolated dredge samples and regional-scale marine and satellite geophysical data.

Existing data provide a limited understanding of the Lord Howe Rise’s crustal structure, sedimentary basin architecture and resource potential. However, building knowledge of Lord Howe Rise 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 JAMSTEC are leading an international effort to drill a deep stratigraphic well through a Lord Howe Rise rift basin that will core Cretaceous and older sediments and potentially basement rocks. This deep riser drilling will extend to a depth of up to about 2500 m below the seafloor. Two shallow, non-riser holes may also be drilled up to ~500 m below the seafloor into basement horst blocks.

A proposal for drilling using the JAMSTEC drilling vessel CHIKYU was submitted to the International Ocean Discovery Program (IODP) in October 2015 (Proposal 871-CPP) and was rated “excellent” by the IODP Science Evaluation Panel in January 2017. The objectives outlined in this IODP proposal are to: 1) define the role and importance of continental crustal ribbons, like the Lord Howe Rise, in plate tectonic cycles and continental evolution; 2) recover new high-latitude biomarker and micropaleontology 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.

The deep stratigraphic drilling is planned for 2019 or 2020, subject to funding approval. Preparations for drilling include a seismic survey conducted in the first half of 2016 that acquired 2D seismic reflection and refraction data along an east–west transect across the Lord Howe Rise to map regional crustal structure and 2D seismic reflection data at the prospective drill sites. Results from this survey helped to better constrain depth to and character of the basement beneath the proposed drill sites and suggest that the crust beneath the Lord Howe Rise is about 20 km thick. Initial velocity models also provide evidence of crustal segmentation linked to lineaments that align with fracture zones in the Tasman Sea oceanic crust. A second survey in late 2017 will acquire the geotechnical data necessary to successfully drill a

 

deep stratigraphic well. This detailed site survey will also acquire high-resolution seabed and shallow sub-seafloor data, shallow sediment cores (up to 20 m below-seafloor) and underwater video.

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