

The Lord Howe Rise Drilling Project: Tectonics, paleoclimate and deep life on the Cretaceous eastern Gondwana margin

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Ribbons of continental crust rifted from continental margins are a product of plate tectonics that can influence the Earth system. Yet we have been unable to fully resolve the tectonic setting and evolution of huge, thinned, submerged continental ribbons like the Lord Howe Rise (LHR), which formed during the final fragmentation of eastern Gondwana. IODP proposal 871-CPP was initially submitted in October 2014 to drill a deep stratigraphic hole through a LHR rift basin up to 3.5 km below the seafloor using *D/V Chikyu*. The objectives of the drilling proposal are to: 1) define the role and importance of continental crustal ribbons 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. The proposal was rated “excellent” in January 2017 and has now progressed to planning stage. A geophysical site survey was undertaken from March to May 2016 in order to characterize the proposed IODP deep drilling sites and to better constrain the crustal-scale geological and tectonic framework of the LHR. The survey obtained deep-crustal seismic reflection and wide-angle refraction profiles across the Tasman Sea oceanic crust and the LHR continental crust. High-resolution 2D seismic reflection profiles at each of the two candidate deep drill sites show possible massive continental basement, layered pre-rift basement, syn-rift Cretaceous sediments, and Paleogene to Neogene post-rift sedimentary sequences.

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