

The ANDRILL Coulman High Project: Japanese contribution to the next phase of the Antarctic Geological Drilling

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The Coulman High Project (CHP) proposes to recover two, high-quality, continuous drill-cores by drilling into Paleogene to lowest Miocene strata beneath the Ross Ice Shelf on the Coulman High in the Ross Embayment, Antarctica. The overarching objective is to establish a history of Cenozoic climate, tectonic and glacial changes in an ice-proximal setting to determine the sensitivity of Antarctica's ice sheets to a range of climatic and tectonic forcings. The sedimentary archives to be recovered in these two ~800-m drill holes will offer a window into the range of environments, ecosystems and tectonic events in the Ross Sea region as it stepped from the warm, high-CO₂ Greenhouse world of the Eocene into the lower-CO₂ and highly variable Icehouse climate of the Oligocene and early Miocene. Antarctica was the keystone in this global climate transition and hosted the growth of ice sheets that started major cryosphere influence on global systems. The sensitivity of the climate system to elevated levels of greenhouse gases, the strength of polar amplification, and the behavior of the AIS in a world warmer than today remain fundamental questions to be addressed by CHP's integrated data-climate modeling studies. These seek to reduce the large uncertainties in predictions of future ice-sheet dynamics and sea level, in part by testing models with ancient scenarios under conditions warmer than today. To improve predictions of long-term future climate and sea level, it is imperative to obtain geological records of past polar climates and ice sheets from time intervals when atmospheric CO₂ was two to four times higher than present levels. Modern observations and instrumental records provide details regarding current and short-term change, but high-fidelity climate records that span previous periods characterized by higher-than-present CO₂ are only available from the Earth's geological records.

The Japanese ANDRILL consortium has decided to join the CHP. In this talk, we will introduce the scientific backgrounds, logistics, and schedule of this drilling project.