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SPOTLIGHT 7. D/V *Chikyu*

In 1990, construction of a new scientific drilling vessel informally called "Godzilla Maru" was proposed to the Japanese government by the Aviation Electronics Council in Japan. Advanced ocean drilling using riser techniques would expand horizons in Earth, ocean, and life sciences and provide unique capabilities in support of international scientific ocean drilling, complementing the riserless US *JOIDES Resolution* drillship and European-supported mission-specific platforms.

The Japanese government decided to move forward with the construction of D/V *Chikyu* in 2001.The Center for Deep Earth Exploration (CDEX) was established within the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in October 2002 to oversee construction and operation of the ship, and *Chikyu* was delivered in July 2005. A shakedown cruise was conducted off the Tōhoku Pacific coastline near Honshu Island prior to Expedition 314, which started in September 2007, the very first *Chikyu* expedition under the umbrella of the 2003–2013 Integrated Ocean Drilling Program.

The *Chikyu* riser drilling capability was designed to reach deeper (>3.0 km) subseafloor targets than any other scientific drilling platform to date. In addition, *Chikyu*'s large hull accommodated extensive and well-equipped onboard laboratories with space for large analytical instruments such as an X-ray CT scanner and an X-ray fluorescence core scanner as well as a shielded geomagnetic laboratory. The stability of the vessel also allowed for high-precision analyses using the onboard inductively coupled plasma mass spectrometer.

As of September 2018, 17 Integrated Ocean Drilling Program and International Ocean Discovery Program (IODP) expeditions have been carried out, with a total of 938 expeditions days, a cumulative drilling depth exceeding 40 km, and 5.6 km of core recovered. *Chikyu* expeditions have been focused on two of the four main IODP science themes, with repeated efforts to significantly improve our understanding of the seismogenic zone and the subseafloor biosphere. These include the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) to drill into the thrust faults of the M8+ seismogenic zone in the Nankai accretionary prism (12 expeditions), subsurface biosphere studies in the Okinawa Trough (IODP Expedition 331) and off the Shimokita Peninsula (IODP Expedition 337), the Japan Trench Fast Drilling Project (JFAST) to study the immediate aftereffects of the 2011 Tōhoku earthquake (IODP Expedition 343), and investigation of the temperature limit of the hot, deep biosphere off Japan's Cape Muroto (IODP Expedition 370).

IODP Expedition 358, initiated on October 7, 2018, and scheduled to end on March 31, 2019, concludes the decadal NanTroSEIZE project. The goal of this expedition is to drill down to the plate boundary fault, about 5 km below the ocean floor, where M8+ class earthquakes occur every 100–150 years. Its successful completion would represent the deepest borehole in the history of scientific ocean drilling. More importantly, it would be a pinnacle in global earthquake research, vastly improving our understanding of this immense geohazard for society, not only in Japan but around the world in other heavily populated seismogenic zones. Finally, as a key aspiration and future target, *Chikyu* aims to drill through the entire ~6–7 km of mature oceanic crust and retrieve core samples from Earth's mantle, below the globally recognized Mohorovičić seismic discontinuity (Moho), a major objective outlined by visionary scientists nearly 60 years ago but not yet achieved in 50 years of scientific ocean drilling.

– Shin'ichi Kuramoto, Nobu Eguchi, and Sean Toczko

Photo credit: JAMSTEC