

## **The *Chikyu* and Ocean Drilling Science**

Asahiko Taira, Shinichi Kuramoto and Daniel Curewithz

Center for Deep Earth Exploration

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

[ataira@jamstec.go.jp](mailto:ataira@jamstec.go.jp)

### **1. Scientific Drilling Vessel, the *Chikyu***

The construction of a Deep Sea Drilling Vessel, the *Chikyu* began in April 2001 and was completed in the summer of 2005 [Taira, 2005]. The *Chikyu* is a 210 meter-long vessel, with a gross tonnage of 57,087 tons, and a drilling derrick standing 121 m above sea level. The *Chikyu* is a state-of-the-art drilling platform, with a highly automated drill floor system capable of being run efficiently and safely by only a small number of operators, and provides a fully integrated riser and blow-out preventer (BOP) drilling system. The *Chikyu* enables operations in geological environments and at depths previously inaccessible to scientific drilling.

The plan for building a new scientific deep-sea drilling vessel in Japan started more than ten years ago. JAMSTEC took leadership for this project, and construction started at the Mitsui Tamano Shipyard and then rigging for drilling system took place at the Mitsubishi Nagasaki Shipyard. The *Chikyu* is designed to drill deeper than ever before beneath the deep-sea floor. The target was set to drill to 7000m, in water depths initially up to 2500m.

The ship is required to remain stationary for a long time at sea against wind, waves, and currents. This stability is achieved by six powerful computer-controlled thrusters with 360-degree, screw-axis rotation capability (azimuth thrusters).

### **2. Floating Laboratory**

Recent progress of earth science suggests that the interaction of interior and exterior of the earth is far active and pervasive than previously estimated. Understanding the role of deep biosphere, huge amount of sub-seafloor gas hydrate and deep-seated circulation of fluids in the earth system dynamics becomes an important issue for the sustainability of the earth-human relationship. The main purpose of operation of the *Chikyu* is to achieve new understanding of the earth system science with the framework of international collaboration.

The *Chikyu* houses advanced and comprehensive scientific research facilities. Four stories of laboratories with an array of tools and equipment provide space for fifty scientists and technical support staffs. With synergy of state-of-art technology and enthusiasm of researchers and engineers, *Chikyu* challenges such objectives as understanding of seismogenic zone of plate boundary, origin of large igneous provinces and island arc crust, tectonic-climate linkage and exploration of deepest biosphere.

### 3.Preparation and Perspective

Currently, the Chikyu and its crew is undergoing full-scale of preparation and test works. System integration and operational testing and training procedures conducted offshore of northern Honshu in October of 2005 focused on pipe handling, drill-string construction, ship positioning, and riser-less drilling and coring (hydraulic piston coring only). Additional operations focused on core handling, curation, description and measurement utilizing the onboard laboratory facilities.

From August to October of 2006, a full riser drilling operational test will take place in the same area as the initial non-riser drilling shakedown operations during 2005, in water depths of 1,200 meters.

All of these preparations and tests are focused on readying the entire operation for the start of IODP operations in September 2007, when the *Chikyu* is scheduled to begin drilling operations in the Kumano Basin area of the Nankai Trough, all as an integral component of the NanTroSEIZE project [Tobin and Kinoshita, 2006].

### REFERENCES

- [1] Taira, A., 2005. The *Chikyu*: Meeting the Challenges of a New Scientific Drilling Era. *Scientific Drilling* 1, pp. 32-33.
- [2] Tobin, H. J. and Kinoshita, M., 2006. NanTroSEIZE: The IODP Nankai Trough Seismogenic Zone Experiment, *Scientific Drilling* 2, pp. 23-27.



Figure 1. A view of The Chikyu cruising in the bay of Tokyo.