

A Perspective of the Mantle Drilling and Observatory Initiative

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Over the past half century, there has been a desire in geoscience to explore the entire sequence of Earth's oceanic crust and to reach the upper mantle beneath the Mohorovičić discontinuity (also termed the "Moho"). Scientists have common knowledge that the mantle as the largest layer of Earth's interior, makes up to about 83% in volume and 67% in weight of our planet; however, nobody has ever seen the pristine mantle. To comprehensively understand the plate tectonics, earth dynamics, and evolution of our planet, drilling through the "Moho" to the mantle, offers an unprecedented opportunity to all the science community of truly integrated scientific approaches toward a better understanding of the ocean, atmosphere, and biosphere on Earth.

The mantle beneath the oceanic crust can ONLY be accessed through scientific ocean drilling. Over the past 50 years, scientific ocean drilling has been a great success to expand our knowledge of the ocean-Earth-life system and provided new insights into the essence of planetary habitability. After years from the first try of mantle drilling in 1950s, the *Chikyu* was built in 2005 as a new generation of scientific ocean drilling vessel. *Chikyu* was born to meet the strong demand that human can know better about our planet by penetrating the oceanic crust down to Earth's upper mantle where is the deepest accessible limit for today's drilling technology.

The challenge into the upper mantle will also provide an excellent opportunity of and potential for the long-term observatory of the mantle and the crustal behaviors. To date, large gaps in our understanding of the Earth's dynamism and the interactions between multi-spheres remain to be filled. Continued international and transdisciplinary collaborations among the scientific ocean drilling community will help all scientists to illuminate the Earth's activities of the planetary system, from deep time to the present, and to the future. NOW is the time to build up the mantle-dedicated scientific ocean drilling program and its initiative for future observatory. In this presentation, the Mantle Drilling Promotion office (MDP), newly established in JAMSTEC in April 2019, will share the concept and perspective of the mantle drilling and observatory initiative.

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