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地質学セミナー

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17時～
場所：総合研究棟Ｂ棟 110 教室

Heavy Metal Meets Hard Rock: Battling through the Ocean Crust's Hardest Rocks

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Integrated Ocean Drilling Program (IODP) Expedition 335 Superfast Spreading Rate Crust 4 recently completed operations in Ocean Drilling Program (ODP) Hole 1256D (Fig.1), a deep scientific borehole that extends more than 1500 meters below the seafloor into the Pacific Ocean's igneous crust – rocks that formed through the cooling and crystallization of magma, and form the basement of the ocean floor. This expedition was the fourth in a series and builds on the efforts of three expeditions in 2002 and 2005. The major scientific objective was to sample a complete section of intact oceanic crust down into gabbros.

Gabbros are coarse-grained intrusive rocks formed by the slow cooling of basaltic magmas. They make up the lower two-thirds of the ocean crust. The minerals, chemistry, and textures of gabbroic rocks preserve records of the processes that occur deep within the Earth's mid-ocean ridges, where new ocean crust is formed.

ODP Hole 1256D lies in the eastern equatorial Pacific Ocean about 900 kilometers to the west of Costa Rica and 1150 kilometers east of the present day East Pacific Rise. This hole is in 15 million year old crust that formed during an episode of "superfast" spreading at the ancient East Pacific Rise, when the newly formed plates were moving apart by more than 200 millimeters per year (mm/yr).

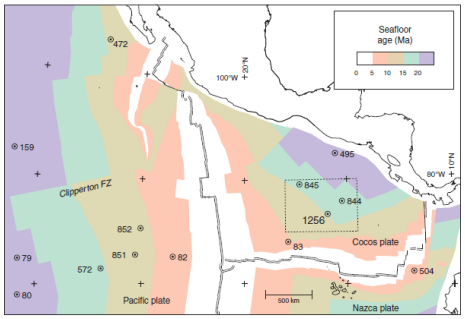

Figure 1. Age map of the Cocos plate and corresponding regionsof the Pacific plate (Wilson, Teagle, Acton, et al., 2003). Isochrons at 5 m.y. intervals have been converted from magnetic anomaly identifications according to the timescale of Cande and Kent (1995). Selected DSDP and ODP sites that reached basement are indicated. The wide spacing of 10-20 m.y. isochrones to the south reflects the extremely fast (200-230 mm/y) full spreading rate. FZ = fracture zone.

This site was chosen on the ground that seismic experiments at active mid-ocean ridges indicated that gabbroic rocks should occur at much shallower depths than in crust formed at slower spreading rates. Previous expeditions to Hole 1256D successfully drilled through the erupted lavas and thin (approximately one-meter-wide) intrusive "dikes" of the upper crust, reaching into the gabbroic rocks of the lower crust. The drilling efforts of Expedition 335 were focused just below the 1500-meter mark in the critical transition zone from dikes to gabbros.

In this zone, the intrusion of magma causes profound textural changes to the surrounding rocks, a process known as contact metamorphism. In the mid-ocean ridge environment this results in the formation of very fine-grained granular rocks, called granoblastic basalts, whose constituent minerals recrystallize at a microscopic scale and become welded together by magmatic heat. The resulting metamorphic rock is as hard as any formation encountered by ocean drilling and sometimes even tougher than the most resilient of hard formation drilling and coring bits.

Expedition 335 operations also succeeded in clearing Hole 1256D of drill cuttings, much of which appear to have been circulating in the hole since earlier expeditions.We recovered a remarkable sample suite of granoblastic basalts along with minor gabbros.As a result, the hole has been stabilized and cleared to its full depth, and is ready for deepening in the near future.

次回のお知らせ

今学期の地質学セミナーは本日で終了です。

連絡先

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