

A new coring system for ROV

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Dredging has long been used as a method to take rocks from the seafloor, but it is impossible to conduct pinpoint sampling. Development of ROVs and manned submersibles enabled pinpoint sampling with watching the seafloor, but still it is not necessarily possible to obtain a particular rock most suitable for a research objective because only fractured rocks with sizes and shapes that can be grabbed by a manipulator can be taken. Thus it is required to develop a coring system that can take rock cores efficiently at a desired point of a seafloor outcrop. Our new coring system is designed to take multiple cores of ~15 centimeters in length at maximum during a single dive of an ROV. In addition, we plan to enable orientation of cores, which has long been desired in particular by paleomagnetists and structural geologists.

The coring system has been developed by Koken Boring Machine Co. Ltd. The drilling rod consists of a rotating outer pipe and a non-rotating inner pipe, which enables to take relatively soft rocks. The inner pipe is a little inclined in the upper part, and hence cores are snapped off at this inclined part when drilling reaches there. A straight line indicating orientation can be marked to a core by a tip installed inside of the inner pipe. Drilling water circulation is inverse (suction) to that of common boring systems, which makes coring operation and a target rock clearly visible from an ROV without discharge of drilling slime. Drilled cores are suck to a core rack by the inverse water flow. Ten cores can be separately stored in the core rack, and a core storage compartment can be changed by moving a lever with a manipulator.

The coring system was tested during the R/V Shinsei-maru KS-17-4 cruise in May 2017 using the ROV HyperDolphin of JAMSTEC. Three dives were conducted at the Toshima Hole in the northern part of the Izu-Ogasawara (Bonin) Arc, and cores of volcanic rocks with orientation marks were successfully retrieved. We plan to further improve the coring system by accumulating experience on various target rocks and operation conditions.