

Development of deep-sea, sub-bottom profiling and detailed seafloor mapping packages for ROV (Remotely Operated Vehicle)

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Mapping of very detailed scale seafloor and profiling of the sub-bottom structure using acoustic systems are being carried out in order to elucidate the physical mechanisms of the deep sea hydrothermal circulation systems which have been found at the back-arc spreading area. To obtain good survey results for our purpose is difficult in conventional surface-towed survey system in which the horizontal imaging resolution is limited because of the distance between the sensor and the target (seafloor). For the purpose of improvement on horizontal resolution, employment of the deep-tow system, which tows the sensor in the vicinity of seafloor, is most practical, and many systems have been developed and used until today. It is not easy, however, to maneuver the towing body altitude sufficiently close to the seafloor in the hydrothermal area where the topography is rugged and the area is rather small. To tackle this problem, the use of ROV (Remotely Operated Vehicle) is considered. Although the navigation of long distance is difficult using the ROV, the high-density 2D survey becomes possible because of the ROV's maneuverability. We have chosen two systems as candidates to be installed on a ROV, i.e. (1) deep-sea sub-bottom profiler and (2) deep-sea side scan sonar. The following are the specifications we are pursuing;

(1) Deep-sea sub-bottom profiler

A light-weight and compact sub-bottom profiler for shallow water is chosen to improve and repackage for the deep sea usage. The system is composed of two units; small and light transducer and electronics unit, and data acquisition unit which is controlled by a notebook computer. The source frequency is 10kHz, and strata (vertical) resolution is 6 cm with up to 40 m bottom penetration. To convert the system for the deep sea, the transducer was exchanged to the deep sea model, and the electronics unit was improved accordingly. Electronics unit and small computer are installed in a separate pressure vessel.

(2) Deep-sea sidescan sonar

We chose a compact sidescan sonar for shallow water mostly because of lowering the cost, but it is more challenging technologically. We are trying to remodel a low-cost, compact sidescan sonar for shallow sea (water depth limitation is 30m) to use in the deep sea. This sidescan sonar is composed of sonar towfish (transducer), cable and a notebook computer (data processor). To accommodate in the deep water, both the main sonar unit and a computer unit are stored in separate pressure vessels. The frequency output of the sidescan sonar is 330kHz, and the ranging distances are from 15m to 120m (single side).