

# ID7- BRITISH GEOLOGICAL SURVEY REMOTELY OPERATED SEA BED ROCKDRILLS AND VIBROCORERS: NEW ADVANCES TO MEET THE NEEDS OF THE SCIENTIFIC COMMUNITY

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*Abstract - The British Geological Survey (BGS) have developed a number of coring and drilling systems for use in science projects in the UK and internationally. These include 3m, 4m and 6m vibrocoring systems; a 5m combined rockdrill and vibro-corer system (RD1); an oriented drill designed specifically to recover samples for use in palaeomagnetic studies; and a 55m rockdrill (RD2).*

*The BGS has recently completed a series of modifications to increase the flexibility and performance of its vibrocoring and rock-drilling capability to meet the ever increasing needs of the scientific community. The latest generation vibrocoring systems can be operated without an umbilical power cable. The new system not only allows vibrocoring in greater water depths, but can also be used on a wider range of vessels including those with limited deck space. The BGS RD2 (Rockdrill2) can core up to 55m sub-seabed by focussing on reducing the overall weight therefore extending operational water depth to 4000m.*

## BATTERY VIBROCORER

The latest development of the much used BGS vibro-corer is an autonomous system compatible with our 3m, 4m and 6m vibrocoring systems that can be used in water depths up to 6000m. Use of a battery system can be deployed using the vessel's own A-frame and winch increasing flexibility and the range of vessels the system can be installed upon such as those with restricted deck space. The autonomous battery system comprises a 6kWh battery pack to run the coring system and subsea hydraulics. Control is provided by a microprocessor with a real-time clock that carried out a number of functions via a pre-set program set up before deployment. Data from the sensors are recorded with a time-stamp, giving diagnostic information that can be downloaded once the system is returned to the deck. Further developments to this system are in progress including the addition of extra sensors and remote communication systems.

The autonomous system was used for the first time in June 2014 on-board the R/V Belgica (Fig. 1A) to acquire samples from 20 sites in the Dangeard and Explorer canyon heads, off the southwest of England in 430m water depth. The system will be used again in May/June 2015 in the Bay of Biscay.

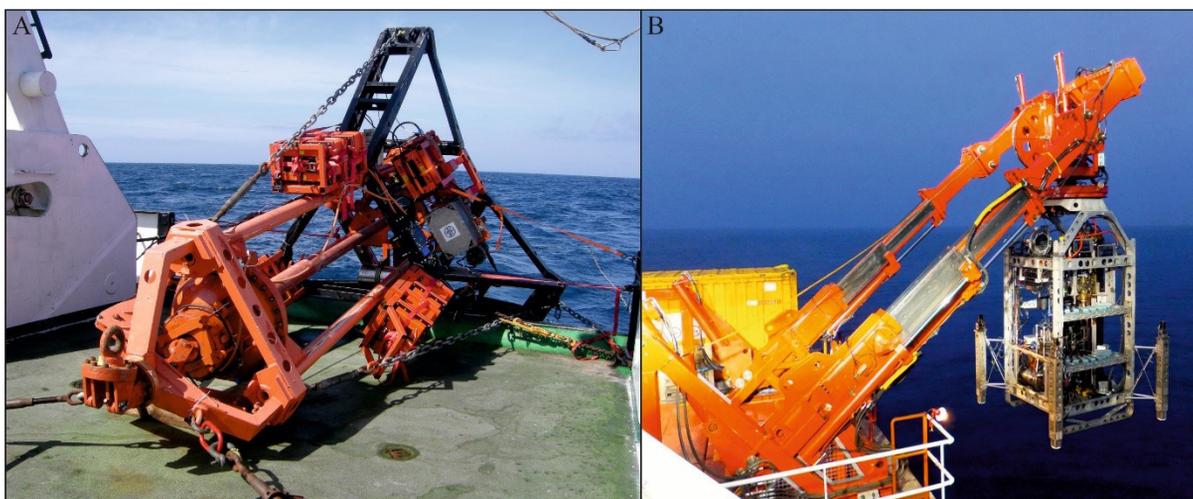
## RD2

RD2 is a multi-barrel wireline subsea remote drill capable of coring up to 55m below sea floor in water depths up to 4000m. The rockdrill is operated via its own launch and recovery system (Fig. 1B) and can be outfitted with additional sensors.

Samples are taken in 1.7 meter sections using an internal core barrel that is recovered through the main drill string into the unit's drill centre. In addition to retrieving cores, the hole can be logged using a range of downhole logging tools. The BGS have an Optical, Acoustic and spectral Gamma (OAG) memory tool, dual-induction tool and magnetic susceptibility tool. A gas capping system has been developed by the BGS for use in gas hydrate entrained sediments for assessing the volume of gas hydrate. The unit also comes with a soft sediment landing system for deployment in areas of soft seabed sediments.

The most recent development is a borehole plug that can be installed in the cored hole. This isolates the borehole from the surrounding sea floor and sea water allowing subsequent borehole water sampling to be carried out by ROV. The next stage will be the installation of sensors within the plug system for the collection data on a long term monitoring basis.

The RD2 has been used to sample hydrate-entrained sediments in the Sea of Japan. The maximum coring depth achieved was 32m below sea floor and the system can operate for more than 50 hours on a single deployment. The RD2 will next be deployed in conjunction with the Bremen University MeBo sea floor rockdrill as part of the International Ocean Discovery Program (IODP) Expedition 357 to core serpentinites at Atlantis Massif, central Atlantic. Additional developments have been made to RD2 for this expedition including an extension to the drill mast allowing standard length logging tools to be deployed downhole, and a tracer system to allow monitoring of contamination of porewater by drilling fluid.



**Fig. 1. (A) The British Geological Survey battery operated vibro-corer on its side on board the R/V Belgica. (B) The BGS RD2 (55 m remotely operated seabed rock drill) being deployed in the Sea of Japan.**