

Sea Bed Drilling Technology MARUM-MeBo: Overview on recent scientific drilling campaigns and technical developments

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The MARUM-MeBo (abbreviation for Meeresboden-Bohrgerät, the German expression for seafloor drill rig) is a robotic drilling system that is developed since 2004 at the MARUM Center for Marine Environmental Sciences at the University of Bremen in close cooperation with Bauer Maschinen GmbH and other industry partners. The MARUM-MeBo drill rigs can be deployed from multipurpose research vessel like, RV MARIA S. MERIAN, RV METEOR, RV SONNE and RV POLARSTERN and are used for getting long cores both in soft sediments as well as hard rocks in the deep sea.

The first generation drill rig, the MARUM-MeBo70 is dedicated for a drilling depth of more than 70 m (Freudenthal and Wefer, 2013). Between 2005 and 2016 it was deployed on 17 research expeditions and drilled about 3 km into different types of geology including carbonate and crystalline rocks, gas hydrates, glacial tills, sands and gravel, glacial till and hemipelagic mud with an average recovery rate of about 70 %.

We used the development and operational experiences of MARUM-MeBo70 for the development of a second generation drill rig MARUM-MeBo200. This drill rig is dedicated for conducting core drilling down to 200 m below sea floor. After successful sea trials in the North Sea in October 2014 the MeBo200 was used on a scientific expedition on the research vessel RV SONNE (SO₂47) in March/April 2016. During 12 deployments we drilled altogether 514 m in hemipelagic sediments with volcanic ashes as well as in muddy and sandy slide deposits off New Zealand. The average core recovery was about 54%. The maximum drilling depth was 105 m below sea floor. Developments for the MeBo drilling technology include the development of a pressure core barrel that was successfully deployed on two research expeditions so far. Bore hole logging adds to the coring capacity. Several autonomous logging probes have been developed in the last years for a deployment with MeBo in the logging while tripping mode – a sonic probe measuring in situ p-wave velocity being the latest development. Various bore hole monitoring systems were developed and deployed with the MeBo system. They allow for long-term monitoring of pressure variability within the sealed bore holes.

References: Freudenthal, T and Wefer, G (2013) Drilling cores on the sea floor with the remote-controlled sea floor drilling rig MeBo. *Geoscientific Instrumentation, Methods and Data Systems*, 2(2). 329-337. doi:10.5194/gi-2-329-2013