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A new Design for Portable Ocean Bottom Seismometers

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Deploying and retrieving temporary networks of portable Ocean Bottom Seismometer (OBS) systems is not only a logistical challenge on the high seas. Many systems and the data they collected during their deployment on the sea floor are lost, because the recovery of the instruments failed. In addition, current methods to deploy the actual seismic broadband sensor from a boom off the OBS frame may expose the seismometer to excessive noise during its deployment on the sea floor. In addition, excessive power consumption of the combined sensor, digitizer, data logger system is a problem. It either reduces the life time of the system on the sea floor or makes it necessary to deploy more batteries.

Here we present a novel design for a portable OBS system. As its frame is made of strong plastic instead of steel it allows for easier handling of the system on the deck of the deployment/retrieval vessel. It also needs less buoyancy during the release/retrieval process. Once on the ocean floor, the seismic sensor is housed under a dome below the center of the frame. This arrangement does not only reduce the noise to which the sensor is exposed. It also prevents damage to the sensor and its housing during recovery, because the sensor does not dangle on a long cable off the boom. We have reduced the power consumption of the whole system to less than 500 mW. This gives the system an operational life time on the sea floor of at least 6 months, when using only two standard spheres to house the batteries. Additional spheres can be added for longer deployments. We are using rechargeable batteries to reduce waste and make redeployment easier. Currently, the system is designed to house intermediate bandwidth feedback seismometers, such as the Guralp CMG-40T or CMG-6T. A version for the wider band CMG-3T is currently being tested.

In order to make recovery more reliable, we have developed a new electromechanical release mechanism. In addition, we are able to launch the frame off the sea floor with the aid of springs. This adds an upward thrust of up to 40 kg. This additional force is especially important, when the frame is stuck in the mud on the seafloor and the buoyancy of the spheres alone would not be enough to lift it. Once the frame has reached the sea surface after its release from the sea floor, it broadcasts its location via a VHF radio, allowing for speedier retrieval by the ships crew.