

Ultra-deep ocean bottom seismographic observations just above the Japan Trench

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Recent giant earthquakes such as the 2011 Tohoku earthquake show large slip zones that generate huge tsunami can be located adjacent to trench. Observations in the vicinity are essential to resolve details of phenomena where the noticeable regions are. However, it is a challenging issue to observe earthquakes and their related phenomena just above the large slip zones because most trenches, which include the Japan Trench, are below ultra-deep sea, whose depth is over 6,000 m. A number of ocean bottom seismometers (OBSs) have been used for marine seismic studies since last century, but most of them are available at less than 6,000 m water depth. Few seismometers equipped with special vessels have been to the deeper zones, but the specialties are barriers in order to make seismic array easily. It is one of the solutions if compact OBSs would be able to be set under ultra-deep sea. We have been developing several compact free-fall/pop-up type OBSs, which include a new type OBS, ultra-deep ocean bottom seismometer (UOBS). It is slightly improved for handling and safety, but basically designed just the same as conventional model for widespread utilization. The UOBS has already enabled to obtain seismic data from just above the Japan Trench since 2012. Each UOBS has a three-component seismometer, a data-logger with a precise clock and batteries inside a housing which is a single glass sphere (dia. 17 in.) with the transponder unit for acoustic communication to vessels, and radio beacon and flashing light for recovery. A prototype UOBS was installed to the sea bottom below more than 6,500 m from sea surface on May 2012. It was recovered after using acoustic transmission. A modified UOBS was deployed below over 7,500 m on August, and recovered on October 2012. We obtained the seismic data from both UOBSs.

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