Development of observation system for tsunami and crustal deformation

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ABSTRACT

The 2011 off the Pacific coast of Tohoku earthquake (M9) occurred at 11 March in last year and huge tsunami brought severe damage around the Tohoku area. The huge earthquake brought large crustal movement. The movements were 24m on the forearc and 50m near the trench (Sato et al., 2011; Fujiwara et al., 2012). The observation, however, was measured after the occurrence and not in real-time. Therefore, we are developing new real-time observation system for tsunami and crustal movement developed by Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and Tohoku University. Our system is composed of seafloor stations and a buoy on sea surface, and these data are sent via satellites in real-time. We selected the m-TRITON buoy developed by JAMSTEC as the platform on sea surface. Because our target is the future Tonankai and Nankai earthquake, the buoy has to adapt slack mooring to stand strong sea current like the Kuroshio with speed of over 5 knots around Japan. We will attach recording systems for tsunami and geodetic movement and the transfer system to send data to satellites in real-time on the buoy. The power supply for them is covered with lithium batteries and the solar power generation. The seafloor station is composed of an equipment to transfer pressure data for tsunami detection and some transponders to detect geodetic movement. Tsunami data recorded by the seafloor pressure sensor is sent acoustically with interval of 15 minutes normally, but the interval changes to 15 seconds in tsunami occurrence. The geodetic movement data is collected with interval of one week. As positioning to monitor geodetic movement with high accuracy less than 10 cm, we adapt the Precise Point Positioning (PPP) technical scheme developed by Japan Aerospace Exploration Agency and have a plan to construct total system to four years.