Experimental challenges for interpretation of in-situ observation of bottom pressure recorders (BPRs) at the seafloor

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The Japan Marine-Earth Science and Technology (JAMSTEC) involves various underwater technologies related to long-term seafloor or borehole observatories in the seismogenic zone, by which real-time measurement by BPRs (Bottom Pressure Recorders) can contribute to early tsunami detection, slow-slip seismic event monitoring, or possibly crustal deformation’ s measurement etc. JAMSTEC has used the ocean-bottom borehole temperature and pressure simulator for the recent one decade in order to promote our knowledges taking place in the in-situ BPRs’ observations. In the presentation, we present the recent experiment which characterize the hydro-dynamic pressure at the seafloor during an earthquake. A moderately strong earthquake occurred while the authors were evaluating the long-term stabilities of bottom pressure recorders (BPRs) in conjunction with a broadband seismometer in JAMSTEC. In this experiment, a hydro-static pressure simulating that at the seafloor with a depth of 1000 m was applied by using a pressure standard (i.e., a piston gauge). Consequently, the pressurized BPRs were able to completely record the pressure fluctuations induced by the vibrations of a dead weight on the piston-cylinder during the earthquake. The experiment effectively demonstrated the aspects of the hydro-dynamic pressure data obtained through in situ observations during the same earthquake. We were also able to simultaneously obtain records from unpressurized BPRs; these data suggest that the internal mechanics of the BPRs were unaffected by the earthquake. This experimental evidence that BPRs can record true in situ pressure changes without instrumentally induced contamination may be useful for more thorough interpretations of in situ BPR observations by those communities that utilize BPRs.

Keywords: Bottom pressure recorder (BPR), Pressure standard, Broadband seismometer

