Noise level of S-net seafloor pressure data in terms of seafloor geodetic use

*Ryota Hino[1], Tatsuya Kubota[2], Naotaka YAMAMOTO CHIKASADA[2], Yusaku Ohta[1], Hideto Otsuka[1]

1. Graduate School of Science, Tohoku University, 2. National Insititute for Earth Science and Disaster Resilience

Long-term continuous observation of seafloor pressure effectively detects seafloor vertical deformations associated with transient tectonic phenomena such as slow slip events (SSEs). The 2011 Tohoku earthquake led to the development of an offshore observation network, the Seafloor observation Network for Earthquakes and Tsunamis along the Japan Trench (S-net), which was established to observe submarine earthquakes and tsunamis. The main purpose of the S-net seafloor pressure monitoring is to detect offshore tsunamis, and it has thus far provided important information concerning various tsunami events. On the other hand, we also expect that the pressure records obtained by S-net can provide invaluable information on slow slip activities via geodetic signals. This study inspects the quality of the S-net pressure data in view of seafloor geodesy by comparison with records obtained by autonomous ocean bottom pressure recorders (OBPRs) deployed along the Japan Trench. OBPRs have long been standard tools in seafloor geodesy and the data collected are considered benchmark in terms of quality. Most of the S-net stations showed noise levels that are considerably higher than those of the OBPRs over periods of more than 2 d. We speculate that a strong correlation between pressure and temperature accounts for much of the long-term noise. In this study, the temperature-dependent fluctuation component was estimated by prediction filtering and removed from the original data, leading to a significant reduction in the noise level. Although no significant pressure changes have been identified as associated with the 2018 Boso SSE or repeated tremor bursts in the northern Japan Trench thus far, we confirmed that there are S-net stations quiet enough to detect tectonic transients associated with SSEs near their expected source locations, after careful noise reduction processes.

Keywords: Seafloor pressure, Slow slip Events, Non-tidal oceanographic fluctuation

