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Examination of magnitude correction for utilizing ocean bottom seismographs of DONET in EEW

HAYASHIMOTO, Naoki[1*], HOSHIBA, Mitsuyuki[1]

[1]Meteorological Research Institute

In ocean areas, the utilization of the ocean bottom seismographs is effective for the rapid detection of the occurrence of an earthquake and also for Earthquake Early Warning (EEW). However, careful handling of these data is required because the installation environment of ocean bottom seismographs may be different from that of land stations. In this study, we examined magnitude correction to utilize the ocean bottom seismographs of DONET for EEW.

In the EEW of JMA, the magnitude is estimated from the maximum amplitude of three dimensional vector summation of the displacement (Kamigaichi (2003)). The magnitude of EEW is determined using two relations: P-wave magnitude and S-wave magnitude (Aketagawa *et al*. (2010), Kiyomoto *et al*. (2010)), whose formulas are as follows:

P-wave M_{eew} = (logA + 1.2∗logR + 0.0005∗R - 0.005∗D + 0.46) / 0.72

S-wave M_{eew} = logA + log(Delta) + 0.0011∗(Delta) + 0.0007∗D + 1.8

Where A is the maximum amplitude measured in 10 micro-meter units, R is the hypocentral distance in km, Delta is the epicentral distance in km, and D is the focal depth in km. To estimate the magnitude correction for DONET, we determined M_{eew} at DONET stations and compared it with M_j. Waveform data observed in April, 2011 or later were analyzed to determine magnitude, when the maximum amplitude of three dimensional vector summation of the displacement was larger than 50 micrometers. For comparison, M_{eew} of Tonankai ocean bottom seismographs and land stations near the DONET were also calculated. Earthquake catalog of the Japan Meteorological Agency was used as focal parameter.

As a result, we showed that S-wave M_{eew} of DONET was generally larger than M_j by about 0.6. And the differences of S-wave M_{eew} and M_j are independent of a size of Magnitude, epicentral distance, or back azimuth, which is also seen at Tonankai ocean bottom seismographs, as Hayashimoto *et al*. (2011) pointed out. We consider that difference of site-effects cause these differences. Furthermore, distribution of the differences of S-wave M_{eew} and M_j seems to have some regional dependence from trench to coastline. A slight change of the subsurface structure such as the sedimentary wedge (seen in Nakamanishi *et al*. (2002)) may causes these differences. In contrast, the clear differences between P-wave M_{eew} and M_j were not found.

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Keywords: Earthquake Early Warning, OBS, DONET, Magnitude correction