

リージョナルデータに対する $M_{\text{hdd}}$ の係数の決定Determination of the coefficients of  $M_{\text{hdd}}$  for regional data\*原 辰彦<sup>1</sup>\*Tatsuhiko Hara<sup>1</sup>

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Hara (2007, EPS) developed a formula to calculate magnitudes using durations of high frequency energy radiation (HFER) and maximum displacement amplitudes using tele-seismic P waves. Hara (2013, SSJ) referred to a magnitude calculated by this formula as  $M_{\text{hdd}}$ . Hara (2014, JpGU) tried to revise the coefficients of the formula by a grid search to reduce the dependences of differences between  $M_{\text{hdd}}$  and  $M_{\text{w}}$  on epicentral distance and HFER duration.  $M_{\text{hdd}}$  calculated by the obtained coefficients were underestimates for larger earthquakes.

Hara (2015, SSJ) investigated the characteristics of  $M_{\text{hdd}}$  for tele-seismic data by another grid search, in which the dependence of  $M_{\text{hdd}}$  on  $M_{\text{w}}$  was taken into account in addition. He proposed a revised formula with small dependences of the differences between  $M_{\text{hdd}}$  and  $M_{\text{w}}$  on epicentral distance, HFER duration, and  $M_{\text{w}}$  allowing a slightly larger RMS of their differences.

In this study, we applied the procedure of Hara (2015) to regional data to determine the coefficients of  $M_{\text{hdd}}$  appropriate for regional distance range. We used broadband data recorded at FDSN stations in the epicentral distance range between 10 and 30 degrees for 60 events that occurred in between 1995 and May 2015. We retrieved data from the IRIS DMC. We conducted the grid search for the  $M_{\text{hdd}}$  coefficients following Hara (2015) and evaluated the dependences of the differences between  $M_{\text{hdd}}$  and  $M_{\text{w}}$  on epicentral distance, HFER duration, and  $M_{\text{w}}$ . As was observed for tele-seismic data, there is a significant  $M_{\text{w}}$  dependence for the set of the coefficients which provides the minimum RMS of the differences between  $M_{\text{hdd}}$  and  $M_{\text{w}}$ . As Hara (2015) showed for tele-seismic data, when we allow a slightly larger RMS of their differences, it is possible to find a set of the coefficients for regional data for which the dependences of their differences on epicentral distance, HFER duration, and  $M_{\text{w}}$  are small.

キーワード：マグニチュード、高周波エネルギー放射

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