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# The feature in the initial P-wave amplitude and the advanced method to estimate epicentral distance using single station

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To estimate epicentral distance using single station data, the B-delta method (Odaka et al., 2003) and the C-delta (Yamamoto, 2010) method are proposed. In these techniques, the coefficient that is calculated by fitting the function to amplitude envelope of the initial P-wave is used to presume epicentral distance. In this study, we confirmed the feature in acceleration amplitude of the initial P-wave, and verified performance of advanced method to estimate epicentral distance using single station data.

First, we grouped seismic waveform data according to hypocentral distances and magnitudes. And we averaged time histories of each group data to examine their features. It is found that the amplitude in the very initial phase (0.5 - 0.7 sec) has a tendency to monotonically increase. And the ratio of amplitude increment doesn't depend on magnitudes but depends on only hypocentral distances. In addition, the ratio can be approximated roughly by a linear function.

Next, we examined the data length to fit a function. We presumed the epicentral distance while increasing the data length by 0.1 seconds, and calculated estimation error in each case. The fitting function was assumed a simple linear function used in the C-delta method. As a result, the estimation error by the linear function using 0.3 sec data length is almost equal to the error by B-delta method (2.0 sec time length). Further, the estimation error by the linear function is converged to minimum roughly at 0.5 - 0.7 seconds, and decreases by 15% comparing with the error by B-delta method (2.0 sec time length).

Keywords: C-delta method, Single station data, Method to estimate epicentral distance