

One problem in the application of discrete wavelet transform to seismic data analysis and its solution

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The discrete wavelet transform is one of the methods for the time-frequency analysis for time-history data, and it has been believed that wavelet coefficients using orthonormal wavelet such as Meyer's wavelet illustrate the energy distribution of time-history data on the time-frequency plane. There are some applications to the seismic phase detection or the group velocity measurement of surface waves based on this idea.

However, the wavelet coefficients using real-valued wavelet such as Meyer's wavelet correspond to band-passed signal (not envelope of a band-passed signal) because time-history data are also real-valued.

Therefore, it is not appropriate to use real-valued wavelet and real-valued time-history data in the application of the discrete wavelet transform to the phase detection based on the idea by Farnbach(1975) or the group velocity measurement of surface waves based on the idea by Dziewonski et al.(1969) on the time-frequency plane.

For such analysis, we should perform the discrete wavelet transform for the complex envelope of a seismic record, and use the distribution of absolute values of wavelet coefficients.

We pointed out this problem and proposed above method as its solution(Okamoto(2000)). Some examples of comparison of the results using our method and conventional method will be illustrated.

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