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I－B213 Phase Identification of Strong Ground Motion Records from K-net – The Kagoshima Earthquakes of 26 March and 13 May 1997

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1. Introduction

Strong motion records of earthquakes have been studied mainly in terms of power spectrum distribution over the frequency or peak acceleration (PGA). The distribution of PGA against the epicentral distance scatters a lot. The power spectrum of a site also differs a lot from that of another site, even if the two sites are close to each other. The reasons are: 1) Acceleration of strong ground motion which affects society is predominant at frequencies of around 1 Hz. ; 2) Seismic wave length, corresponding to the mentioned frequencies, is so short (less than 500 m) that many local inhomogeneities, existing between the seismic source and the observation site, can distort the wave form; 3) In addition, it is not certain how many seismic sources generate waves with a given frequency. Separation or discrimination of the earthquake source effect form the wave propagation medium is impossible. The above reasons have prevented earthquake engineers from looking into the accelerograms more theoretically.

Instead, some researchers have synthesized the ground acceleration due to an earthquake, assuming some physical parameters of the earthquake process as mechanism parameters (fault length, rupture velocity) and structural parameters of the seismic wave medium. It seems that these research ways become predominant, thanks to the increasing power of computers. There are still many problems, however, in computer synthesis: enormous computation time, strong dependency upon the particular cases.

Present authors will look into accelerograms carefully to withdraw or find information, which the accelerogram itself should carry to the site, but which has escaped from our notice. For this purpose, methods of joint time-frequency analysis are adopted.

2. Feasibility test of the methods

Principal concept of joint time-frequency analysis is to know signal behavior with respect to time. In this analysis, signal is not supposed to sustain spectrum distribution over the whole time interval. Currently there are many methods developed as short time Fourier transform, wavelets, Wigner-Ville distribution, Cohen's class etc. (Chien et al 1996). The present paper discusses a comparison of these methods as a feasibility test for accelerogram analysis. Methods are applied to real accelerograms, recorded by K-net. The K-net is strong motion observation network deployed by Science and Technology Agency of the Japanese Government.

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3. The Kagoshima Earthquakes of 26 March and 13 May 1997

Two earthquakes took place at the northwestern part of the kagoshima prefecture, Japan on 26 March and 13 May 1997. Epicenters and some of K-net stations are seen in Figure 1. The solid lines give after-shock distribution (Miyamachi et al, 1997). Accelerograms at these stations are analyzed and compared each other in terms of different methods in Figure 2.

We should take note of the following points: 1) Methods could show the time of S-wave arrival (Ichikawa et al, 1971); 2) Some dispersive waves are found before and after S-wave arrival. The phases after it might be surface waves; 3) In addition to these phases, a couple of strong wave radiation are observed. These phases will be investigated in a further research.

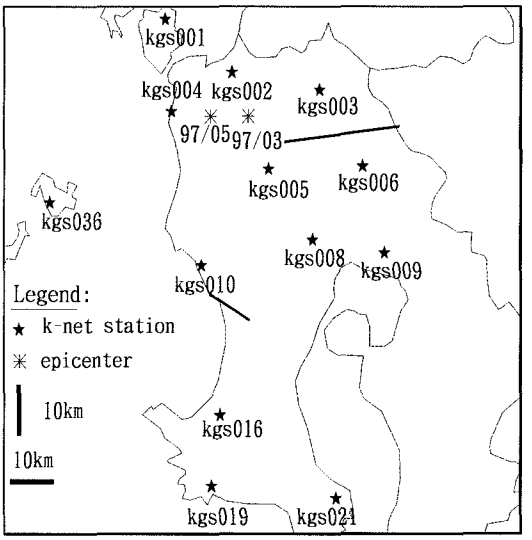

Fig.1 The epicenters of Kagoshima earthquakes and K-net stations (The solid lines give after-shock distribution)

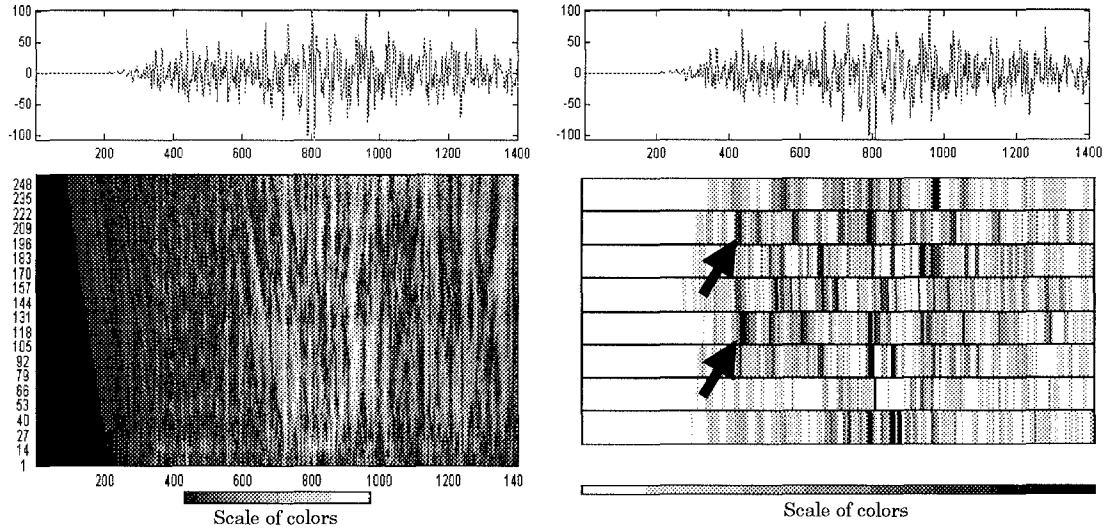

Fig.2 CWT and Wavelet Packets of accelerogram form kgs001, E-W

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