NOTE AND CORRESPONDENCE

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Fractal Characterization of Seismic Networks in Taiwan

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ABSTRACT

The fractal dimension is calculated for the geometrical distributions of the seismic stations of three networks (the old CWB seismic network, the TTSN and the CWBSN) in Taiwan based on the correlation integral algorithm proposed by Hirata *et al.* (1987). Results show that the distribution of the data points of correlation integral for the old CWB seismic network distribute very irregularly and cannot be approximated by a fractal set point. The fractal dimesion value for the TTSN (1.18±0.02) is less than that for the CWBSN (1.56±0.01). This indicates that the dimension resolution and the detectability of sparse phenomena are lower for the former than the latter.

(Key words: Seismic network, Correlation integral, Fractal dimension)

Fractal properties are commonly found with natural phenomena (Mendelbrot, 1983). In 1986 Lovejoy and his associates (Lovejoy *et al.*, 1986a, b; Lovejoy and Schertzer, 1986) reported that the World Meteorological Station Network (9563 stations) constitutes a 1.75-dimensional fractal set on the 2-D surface of the Earth, the French Climatological Network (3593 stations) a 1.8-dimensional set, and the Canadian Meteorological Network (414 stations) only a 1.5-dimensional set. Lovejoy *et al.* (1986a) also stated that to detect phenomena, not only must a network have sufficient spatial resolution, but it must also have sufficient dimensional resolution. Whenever the fractal dimension D_f is less than the Euclidian dimension D_e of the embedding space, sparsely distributed phenomena with a dimension of less than D_e-D_f cannot be detected. Korvin *et al.* (1990) stated that the spatial distribution of the South Australian gravity station network (over 65000 stations) can be approximated by a fractal point set of correlation dimension D=1.4.

The collision of the Philippine Sea and Eurasian plates together with the spreading of the Okinawa Trough have resulted in high seismicity in the Taiwan region. To monitor the earthquake occurrences, at the end of the last century the Japanese started to install seismic stations, and finally constructed a network consisting of 17 stations by 1950. Since then, this network has been operated by the Central Weather Bureau (CWB), of the ROC (Yeh *et al.*, 1989). This network is referred to as the old CWB seismic network in this study. In order to

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