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Correlation dimension of hypocentral distributions and information entropy

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We analyze statistical characteristics of hypocenter distributions. In order to express quantitative characteristics about the distributions, we consider correlation dimension, a kind of fractal dimension. Correlation dimension, the value characterizing seismicity, is calculated by correlation integral method (Kagan and Knopoff, 1980; Grassberger and Procaccia, 1983).

We analyze correlation dimension for 2003 Tokachi-oki earthquakes in Japan and earthquakes worldwide. For 2003 Tokachi-oki earthquakes the result is that the correlation dimension is about 1.8 in the scale of 20 km. This means that the earthquakes are distributed at the boundary of plates. For the earthquakes worldwide the result is that the correlation dimension is about 1.2 in the scale of 1000 km. This means that the earthquakes are distributed at plate margins.

But 2003 Tokachi-oki earthquakes are concentrated in some clusters, are not distributed homogeneously. The earthquakes worldwide are also concentrated in some regions of plate margins.

To explain their results we analyze relationships correlation dimension and locations or size of the clusters, and consider new mathematical models. And we analyze the mathematical models probabilistically by information entropy.

Keywords: Hypocentral distributions