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西南日本の微小地震活動の次元圧縮解析
dimension reduction analysis of microseismicity rate in SW Japan

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Miroseismic activities ranging from M1 to M2 mean micro-slip of small shear cracks in the rocks of crust and mantle. Considering that the open cracks associated with shear cracks are sensitive of small change of strain and stress and their orientations, microseismicity rate represents number of active shear cracks controlled by shear plane orientation. To infer the hidden states and processes of the plate boundary zone many time series of microseismicity rate of various volumes in the plate and crust should be investigated by means of date mining methods with non-supervised machine learning.

Therefore, the author studied the dimension reduction method by means of principal component analysis to apply for the high dimension vector data sets of time series (1998-2008 data set of JMA1) of microseismicity rate of various volumes of subduction slab of Philippine sea plate and overriding crust of southwest Japan arc as shown in the previous paper (1). The original dimension is 104 and reduced dimension becomes 10. Numbers of time series is took as 120, and thus the sample matrix shows 104 x 120.

Results of dimension reduction of time series of microseismicity rate of the PSP and arc crust represent clearly that the aftershock microseismicity associated with large earthquakes can be sharply dissolved as major PCA components and that the annual periodicity can be observed in the higher order components. It also concluded that the long term changes of several lower order components are identified. The resolved shear stress on microcracks by tidal force may be responsible for the annual periodicity of some PCA components but the long term changes should be derived from the plate motion and related local stress concentration.

1) Toriumi, M., 2009, J.D.R,4.

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