Earthquake Prediction Network by Multipoint Observation of Atmospheric Ions

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Preface

Most atmospheric ions consist of air molecule which carried out radiation disintegration by Rn and Tn emitted from underground and these daughter nuclide.

Having observed the unusual increase of atmospheric ions by apparatus as the sign of an earthquake has first The Southern Hyogo Prefecture Earthquake (Kobe Earthquake) in 1995(Satsutani, 1996).

Atmospheric ion concentration measuring instrument which was being used at this time is purchased from Kobe Dempa, Inc., and continuation measurement is carried out only at Okayama University of Science observing for 365 days for 24 hours.

Statistical examination

Experiential, positive large ion (particle size : 0.02-0.007 micrometers) concentration is observing 5000(ions/cc) or more as a high rank of an earthquake hazard.

Incidentally, the average value of atmospheric ion concentration for 3 years after 1999 was 963(ions/cc), the standard deviation was 435, the standard error was 1.8. 3000(ions/cc) or more data is only 0.2% of only the whole. In this meaning, the range of everyday concentration is settled or less in 3000(ions/cc)in Okayama University of Science.This value is General SPM is also included. Neighboring environmental understanding and a neighboring data spectrum analysis consider separation of atmospheric ions and SPM quantitatively.

Atmospheric ion concentration and earthquake

The concentration unusual rise (5000 or more pieces/cc) was made into the concentration of atmospheric ions unusual value. It is 33 days to have exceeded the unusual value in five years from the 1998. The object earthquake used Japan Meteorological Agency data (1998.3.1-2003.4.30) Correspondence of the rise time of atmospheric concentration and earthquake occurrence time is shown table1. The number of the earthquakes beyond M4.0 which occurred corresponding to 33 days of the abnormalities in atmospheric ions concentration is 31. Precedence time until an object earthquake occurs from the time in which atmospheric ions concentration rose using table1 is calculated. The graph(fig1) shows this relation for five years. The logarithm of precedence time -- on the horizontal axis, the initial value of each earthquake as opposed to the total days value (100) of the abnormalities in air ion concentration for a display was accumulated -- graph illustration was carried out

The necessity for multipoint observation

The number of the earthquakes (more than M4) for these 5 years is 116. As a problem when counting the number of earthquakes,

(1) Within several days, in the same place, though the earthquake of M5.4, M4.3, and M4.0 occurs, it counts as 1 time. On the other hand, on the database, it is counted with 3 times.

(2) When an earthquake occurs in Tottori and Wakayama on the same day, it cannot be distinguished in the present condition which earthquake is related with the abnormalities of atmospheric ion concentration. This is a limit in single point observation. For this reason, arrangement of the high-concentration observation network of many points was planned.

Construction of a multipoint observation network

It is desirable to install atmospheric ions measuring instrument in all parts of Japan in multi-point observation at two or more points (for mutual distance to be less than 100km). The degrees of earthquake occurrence, geology, geographical feature, active fault, social importance, etc. are taken into consideration by selection of a measuring point. The concentration data observed at the every place point is transmitted to a collection base online. This collection data processes information according to the procedure which it was accumulated and managed by the database and was decided to be it in advance on the computer in a base.

表１　大気イオン濃度異常上昇日時と地震発生日時の対応表

イオン濃度上昇日時	正大イオン濃度	発震日時	震源地	緯度	経度	M	深さ	震央距離	震源距離	方位角(°)
1998/03/08 17:00	7039									
1998/03/14 02:30	6410									
1998/03/28 16:30	9610									
1998/04/04 14:30	7334									
1998/04/04 15:00	10308									
1998/04/04 15:30	11306									
1998/04/04 16:30	5671									
1998/04/04 17:30	5900									
1998/04/04 18:00	5806									
		1998/04/22 20:29:48.9	岐阜県美濃中西部	35.171	136.565	4.8	9.0	245.857	246.022	76.792
		1998/04/22 20:32:48.4	岐阜県美濃中西部	35.172	136.566	5.4	7.7	245.969	246.089	76.771
		1998/05/06 07:59:00.4	紀伊半島沖	33.349	135.772	4.3	21.4	226.132	227.143	130.877
1998/05/11 14:30	9291									
		1998/05/23 04:49:35.2	択捉島	33.701	131.845	5.3	85.5	221.314	237.255	240.667
		1998/05/29 09:09:35.9	愛媛県東予地方	33.530	132.426	4.1	43.9	169.572	194.589	227.374

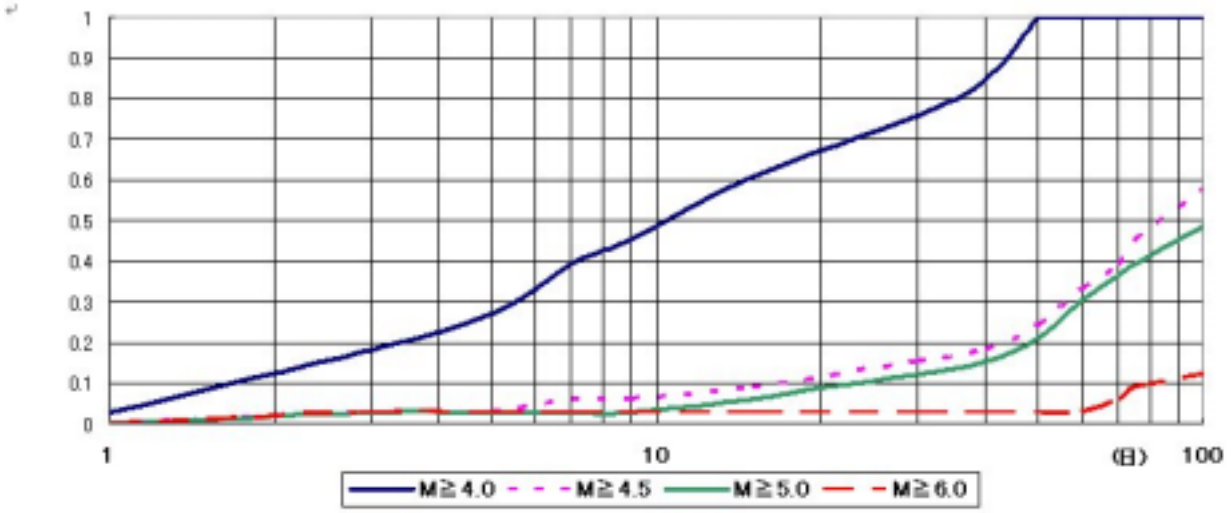

図１　R≧300kmにおける先行時間の累積相対度数