

Spatiotemporal Characteristics of b-value and TEC Variations before the Large Earthquakes in Japan

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In recent years, there are many reports on electromagnetic phenomenon preceding large earthquakes. Anomaly of the total electron content (TEC) is one of the most promising anomalies for the short-term earthquake forecast. On the other hand, it is reported that the b-value around the epicenter region decreases prior to the large earthquake. The b-value can compute using the Gutenberg Richter law. The lead time is around few or tens of years. We can't discriminate anomalous changes on earthquakes and solar activities easily at the moment. In this paper, we try to develop a method for the earthquake short-term forecast using the b-value and the TEC analysis. We investigate the effectiveness of the integrated analyses on the b-value for the middle-term forecast and TEC analysis for the short-term forecast.

We select the 2003, 2008 Tokachi-oki EQ (M8.0) and the 2011 Tohoku-oki EQ. As results, we found the variation of b-value has a tendency to decrease for M7class EQs in the analyzed regions and the neighbor's area. For the 2003 Tokachi-oki EQ, we investigated temporal variation for the b-value with interval of 1 day. We found decrease of b-value occurred 16 days and 2-3 days before the main shock. On the other hand, for anomaly of the TEC in the Hokkaido-region, we found significant increase of TEC 2 days before the EQ ($M > 6.0, D < 40$ km) using the statistical analysis during 1998-2015. That is, the positive anomaly is dominant, In the case of the 2003 Tokachi-oki EQ, TEC anomaly occurred 2 days before main shock. However, immediately after this TEC anomaly, solar activity becomes active, and after that, positive anomaly may be masked from solar activity. From these results, in the 2003 Tokachi-oki EQ, we found that anomaly of b-value occurred 16 days before main shock after that, TEC anomaly occurred. The results for the 2011 Tohoku-oki EQ show the similar tendency in b-value and TEC variations.

From above results, we can conclude that simultaneous use of the b-value and the TEC analysis is suggestive of the effectiveness in short-term earthquake forecast for the M7 or higher earthquakes. Details will be given in the presentation.

Keywords: Earthquake, Electromagnetics, b-value