

Correlation between earthquake occurrence and the VHF propagation anomaly indicated by objectively produced prediction maps

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Radio waves intensity in the VHF frequency band, used by FM broadcast stations beyond the line of sight, sometimes increases shortly before earthquakes (Moriya et al., 2010). Hokkaido University monitors this anomalous VHF-band radio-wave propagation at 12 locations in Hokkaido. In this study, we used data at Erimo station for 2006 to 2015 to make Earthquake prediction maps. If 6 min-average sampled data exceeds a threshold in 2 consecutive samples, we labeled that time as anomaly (Morita and Mogi, 2015, IUGG). After anomaly, we turn ON the alarm for a certain period of time L , and this divide all time into "Alarm ON", "Alarm OFF", and "Undecided (due to missing data)" periods. After excluding the Undecided period, we measured " r " the fraction of the period of alarm ON and " s " the fraction of earthquakes that occurred during periods of Alarm ON. The gain of the map is calculated as $G = s/r$. We found $G > 1$ for most prediction maps. We further calculated "p-value". Our best p-value of 0.036 was obtained for the prediction map with $L = 4$ days when it was evaluated against the occurrence of $M > 5$ earthquakes. G in this case was 2.1. The present result is not strong enough, but by refining the extraction criteria of anomaly, we think there's a good chance to firmly establish that some of beyond the line of sight VHF propagation are earthquake precursors.

Keywords: Earthquake prediction map, objective algorithm