

Direction finding of ULF/ELF geomagnetic field data possibility associated with the 2004 Sumatra-Andaman earthquake.

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Anomalous ULF geomagnetic field change is one of the most convincing and promising phenomena. Due to the deeper skin depth of ULF waves, the ULF signal can be detected by the sensors on the ground. The detectable distance is about 100 km in the case of the earthquake with $M=7$. However, Ohta et al. (2006), reported the possibility of a long distance propagation of ULF/ELF magnetic signal associated with large earthquakes observed at Nakatsugawa station. However, their analyzed data length are short and they don't consider seasonal variation of direction of ULF/ELF wave arrival.

In order to verify their result, we analyze the long-term data observed at Matsushiro, Nagano, in Japan and Urumqi, in China. We compute the direction of wave arrival directions using the goniometer method and monthly arrival rates.

The result shows that the rate of the direction of arrival from Sumatra island exceeds $+2\sigma$ 1~2 months before the 2004 Sumatra-Andaman earthquake.

It suggests the possibility of long distance propagation of ULF/ELF signals and the ULF signals can penetrate from the source region to the free space and/or atmospheric/ionospheric perturbation creates new electromagnetic signals.