

## Direction finding of ULF/ELF magnetic phenomena preceding the 2004 Sumatra-Andaman earthquake

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Anomalous ULF geomagnetic field change is one of the most convincing and promising phenomena for earthquake-related electromagnetic studies such emissions from the crust of the source region. Due to the deeper skin depth of ULF waves, the ULF signal can detect 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 based on the magnetic data observed at Nakatsugawa. In order to verify their result preceding large earthquakes (the 2004 Sumatra-Andaman earthquake ( $M9$ )), we analyze the data observed at Matsushiro, Nagano, in Japan and Urmuqi in China. We estimate the direction of arrival using the goniometric approach. The result shows there is a tendency the signals come from the epicenter region. It suggests that possibility of long distance proppagation of ULF/ELF signals and the ULF/ELF signals can penetrate from the source region to the free space and/or atmospheric/ionospheric perturbation creates new electromagnetic signals due to weak discharges.