ULF GEOMAGNETIC ANOMALIES ASSOCIATED WITH EARTHQUAKES

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This report is the summary of observational facts associated with earthquake related ULF emissions in 5 years project of RIKEN IFREQ and NASDA – UEC group (1997.4 - 2002.3). The aim of this project is to estimate probability of ULF phenomena associated with large earthquakes and also a reliability of possible short-term earthquake prediction and monitoring of crustal activities using the ULF effects. RIKEN / UEC-NASDA scientific group is going to extend the ULF research in collaboration with Russian and Ukrainian researchers, and so on. The 5 year project will terminate on March, 2002, but we would like to do continuous observation and analyze data at possible stations. The concluding remarks at the present stage are as follows:

(1) Practical basis for the regular ground ULF monitoring system has been established in Japan. It consists of Kanto-Tokai network composed by sensitive sensors (torsion and search coil type magnetometers type) with high sampling rate and stations with a fluxgate type magnetometer. The network we have installed over the Kanto-Tokai region has base lines of 5km, tens km, and 100km.

(2) ULF magnetic data associated with earthquakes have been analyzed. Convincing results on the existence of preceding ULF magnetic anomaly have been obtained for Kagoshima earthquakes , Iwate earthquake, Izu earthquake swarm, Biak earthquake, and earthquakes observed at Matsushiro station.
- Enhancement of polarization (intensity ratio of vertical and horizontal components) a few weeks preceding the main shock.
- Tendency of increase of horizontal components just before the earthquake.
- As for polarization analysis, the detectable distances are about 60 km for the earthquake with M=6 and 100 km for the earthquake with M = 7.

(3) Principal component analysis has been adapted to the horizontal component data observed at Izu. Analyzed data have been from three sensors set at 5 km distances. A few days before M>6 earthquakes, anomalous behavior has been detected in the smallest eigenvalue during Izu earthquake swarm in 2000.

(4) In order to remove the global effects such as geomagnetic pulsasions, the usage of remote reference data is very effective. Especially, data observed at the geomagnetic conjugate station which is located in an inactive seismic zone.