

Ground based intense electromagnetic observation by RIKEN International Frontier Program on Earthquakes

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In the summer of 2000, we had very intense earthquake swarms and volcanic activities in and around Izu islands including Miyakejima Island. These activities were located in the area covered by our DC and ULF remote stations.

One of our DC geoelectric potential monitoring stations in Niijima Island recorded SES activity type signals. It started at the end of April 2000 and lasted to the end of August.

Concerning ULF magnetic data, we applied PCA analysis and traced temporal changes of eigenvalues of around 0.01 Hz and found that the temporal changes of one of the three eigenvalues showed a similar behavior as that of DC geoelectric potential difference at Niijima Island.

After the devastating Kobe earthquake (EQ) in 1995, Science and Technology Agency initiated the five-year new EQ prediction research under the framework of 'Earthquake Frontier Projects' in 1996. RIKEN's program is one of the sub-projects to apply mainly DC geoelectric potential monitoring method (VAN method) and three-component magnetic monitoring in ultra low frequency (ULF) range. The RIKEN program installed Greek VAN type geoelectric potential difference monitoring system and ULF magnetic sensors in Japan. As of February 2001, we have about 40 remote stations. Concerning ULF magnetic monitoring system, we have deployed sensitive sensors (torsion and search coil type magnetometers) with high sampling rate and stations with a fluxgate type magnetometer.

In the summer of 2000, we had very intense earthquake swarms and volcanic activities in and around Izu islands including Miyakejima Island. These activities were located in the area covered by our DC and ULF remote stations. The seismic activity started on June 26 beneath Miyakejima Island and followed by volcanic eruption. These intense seismic activities continued about three months and not yet completely terminated even now.

One of our DC geoelectric potential monitoring stations in Niijima Island recorded SES activity type signals. It started at the end of April 2000 and lasted to the end of August. Concerning ULF magnetic data, a magnetic array, which consists of 'three' three-component magnetic sensors with inter sensor distance of about 5km, in Izu peninsula was operated. At the first glance, we cannot depict any precursory signals in raw data. Therefore, we applied principal component analysis (PCA), by which theoretically we can distinguish three different sources. We traced temporal changes of eigenvalues of around 0.01 Hz range and found that the temporal changes of one of the three eigenvalues showed a similar behavior as that of DC geoelectric potential difference at Niijima Island.

We consider that these results are of very unique significance because two independent observation methods (DC electric potential difference and three-component magnetic observation) showed very similar temporal changes preceding the local seismic activity.