E074-003 Room: 201B Time: May 26 9:30-9:45

Geomagnetic Field Variation Associated with 2000 Izu Earthquake Swarm

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Electromagnetic phenomena are recently considered as a promising candidate for short-term earthquake prediction. There have been accumulated a lot of evidence of precursory signatures in a wide frequency range (DC-VHF). The ULF range is one of the most promising phenomena. The purpose of this report is to find out any ULF geomagnetic signature for Izu Islands Earthquakes in July, 2000.

On June 26, 2000, an official alarm was issued for imminent volcanic activity of volcano Oyama, Miyake-jima Island by JMA based on increased occurrences of small earthquakes under the island. In the next morning, at several km west of the island, there was an indication of undersea eruption and the seismic swarm activity started almost simultaneously. Earthquake epicenters also migrated from the island first westward and then northwestward. There are five large earthquakes (M greater than 6) during this activity.

The ULF geomagnetic data observed at Izu Peninsula in Japan have been investigated. Three stations are closely distributed in the peninsula. The inter-sensor distance is about 5 km. Torsion type magnetometers with three components are in operation at 50 Hz and 12.5 Hz sampling rate there. The rough epicentral distances are about 60-100 km for Izu stations. In order to extract any ULF signature of Izu Islands Earthquakes, the principal component analysis (PCA) and gradient of magnetic field have been investigated. For PCA, data of NS component from February, 2000 to December, 2002 have been analyzed. The procedure of PCA is as follows. First, the ULF waveform data are down sampled at 12.5 Hz and they are fed to numerical narrow-band pass filters without delay. We adopt PCA to the time series data of 30 minutes observed at closely distributed stations. Consider that data are given by yi = [yi(t1), yi(t2),.., yi(t22500)]^T, Then, the data matrix Y = [y1, y2, y3]^T is obtained, where ^T means transpose. Then, we calculate the variance matrix R = YY^T. After that eigenvalue decomposition of R have been done, R = VLV^T where L is eigenvalue matrix with l1, l2 and l3 and V is the eigenvectors matrix. We discuss the temporal evolution of the eigenvalue and eigenvector at a particular frequency of 10 mHz. The important findings are as follows. The nighttime variation of sqrt (l3) shows the possible correlation to earthquakes with M greater than 6 because abrupt increases a few days before the large earthquake occurred on July 1, July 9 and July 15. Corresponding eigenvectors also change in the vector space. It means additional small noise seemed to be detected and it is highly suggestive of correlation of large earthquakes.

In the gradient analysis, we find out that there is a strange frequency pattern a few weeks before the swarm activity and during swarm activity. Details will be presented in the session.