DIRECT MAGNETIC SIGNALS FROM EARTHQUAKE FAULTING: IWATE-MIYAGI EATRTHQUAKE OF M 7.2, JAPAN.

Kan Okubo 1), Nobunao Takeuchi 2), Mitsuru Utsugi 3), Kiyofumi Yumoto 4), Yoichi SASAI 5)

1) Division of Information and Communications Systems Engineering, Tokyo Metropolitan University, Hino City, Tokyo, Japan.
2) Department of Electronic and Information Systems, Akita Prefectural University, Yurihonjo City, Akita, Japan.
3) Aso Volcanological Laboratory, Kyoto University, Kumamoto, Japan.
4) Space Environment Center, Kyushu University, Fukuoka, Japan.
5) Disaster Prevention Division, Bureau of General Affairs, Tokyo Metropolitan Government, Tokyo, Japan. E-mail: yosasai@zag.att.ne.jp

Most of reported geomagnetic field changes at the time of earthquakes are "coseismic" step-like offsets in the geomagnetic field, which are regarded as the piezomagnetic effect caused by stress changes due to earthquake faulting (Stacey, 1964). Proton precession magnetometers have so far been mainly used to detect the seismomagnetic effect, of which measurement interval was usually 1 or 10 minutes and measurement accuracy was 0.1 nT. For seismomagnetic observations we employed this time flux-gate magnetometers whose specifications are the measurement with accuracy of 0.01 nT and with the sampling interval of 0.5 or 1 sec. By virtue of such highly sensitive magnetometers, we observed the co-seismic magnetic signals accompanied with the fault movement. Our observation site happened to be situated at an epicentral distance of 26 km from the June 14, 2008 Iwate-Miyagi Nairiku earthquake of M 7.2, NE Japan. Magnetic field components began to change almost simultaneously with the onset of the earthquake to grow up monotonously until the first P wave arrival. Such coseismic magnetic signals are most probably generated by the growing stress field due to faulting, i.e. the piezomagnetic effect, rather than the seismic dynamo effect (Honkura et al., 2002) or electromagnetic induction within the conducting crust. This is because they lack oscillatory features like seismic waves. We attempt to interpret the observations with the aid of static piezomagnetic models (Utsugi et al., 2000).

coseismic magnetic signals, piezomagnetic effect, moving dislocations

Yoichi Sasai, Disaster Prevention Division, Tokyo Metropolitan Government, 2-8-1, Nishi-Shinjuku, Shinjuku-ku, Tokyo, 163-8001, Japan. E-mail: yosasai@zag.att.ne.jp