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Abstract 1-07

On the geomagnetic total intensity change associated with East Shizuoka earthquake on the 15 March 2011

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The geomagnetic total intensity change which appeared coseismically as an offset was detected accompanying 2011 East Shizuoka earthquake by the observation network installed in the focal area around Mt. Fuji (Figs. 1 and 2). The offset amounts to -2.34±0.34, +1.37±0.44 and -0.60±0.51 nT at the observation sites FJM, FUJ and FJ1, respectively.

Expected geomagnetic change due to the piezomagnetic effect was evaluated with the forward calculation code by Utsugi et al. (2000) [1] to numerically discuss the detected change, with the focal parameters determined by Geospatial Information Authority of Japan (GSI) (2011) [2] and National Research Institute for Earth Science and Disaster Prevention (NIED) (2011) [3]. However, the dominant changes detected at FJM, FUJ and FJ1 which are negative, positive and negative respectively cannot be solved. By modifying the focal parameters determined by NIED, the length and the width from 6 km to 8 km and the location of the fault to the north by 1.9 km, the fundamental characteristics of the detected geomagnetic total intensity changes can be explained by the expected geomagnetic change (Fig. 3). In addition the modification of the focal parameters causes better coverage of the aftershock distribution by the fault plane (Fig. 4). The result reveals the possibility that considering coseismic geomagnetic field change can contribute more precise determination of the focal parameters.

References

[1.] Utsugi, M., Y. Nishida and Y. Sasai, Piezomagnetic potentials due to an inclined rectangular fault in a semi-infinite medium, Geophys. J. Int., 140, 479-492, 2000.

[2.] Geospatial Information Authority of Japan, Crustal Deformations around Mt. Fuji Volcano, Report of Coordinating Committee for Prediction of Volcanic Eruption, 108, in press, 2011.

[3.] National Research Institute for Earth Science and Disaster Prevention, M6.4 earthquake occurred in the eastern part of Shizuoka prefecture (south slope of Fuji volcano) on March 15, 2011, Report of Coordinating Committee for Prediction of Volcanic Eruption, 108, in press, 2011.

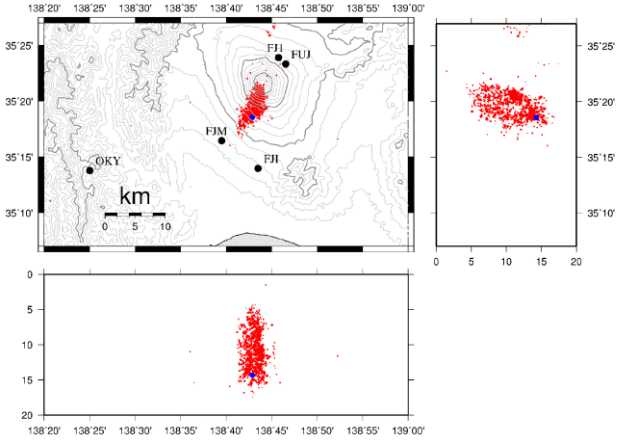

Fig. 1: The locations of total geomagnetic intensity observation sites (black closed circles), the main shock (a blue closed circle) and the aftershocks until the 30, April, 2011 (red dots, JMA earthquake catalogue). The observation sites are FUJ and FJI by GSI, and FJ1, FJM and OKY by ERI.

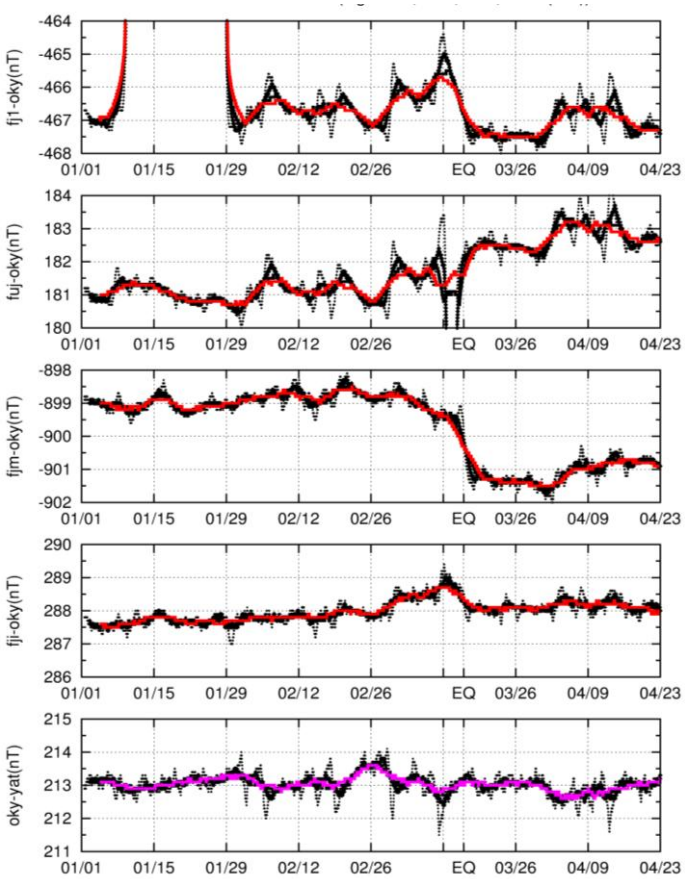

Fig. 2: Time series of the geomagnetic total intensity at FJ1, FUJ, FJM and FJI with the reference site at OKY, and at OKY with the reference site at YAT (ERI), after applying the median filter with the window length of 1441 (black dotted lines), 4321 (black broken lines), 7201 (black solid lines) and 10081 (colored solid lines) minutes. The time of the main shock is shown as “EQ” along the horizontal axes.

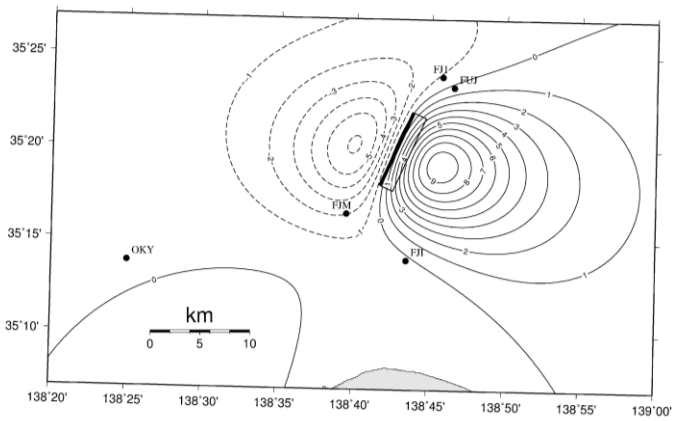

Fig. 3: Expected geomagnetic total intensity change due to the piezomagnetic effect. Substituted physical parameters are listed in Table 1.

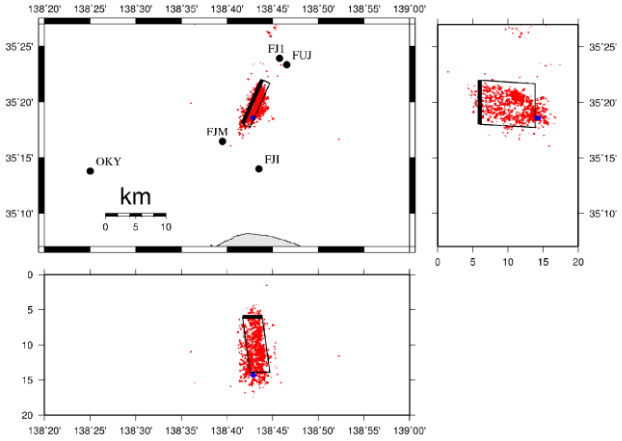

Fig. 4: The main shock and aftershock distribution and the fault plane for forward calculation of the piezomagnetic response.

Table 1: Physical parameters substituted for the forward calculation.

Poisson's ratio	0.25
Initial intensity of the magnetization (A/m)	10
Stress sensitivity (Pa^{-1})	8×10^{-9}
Inclination of the initial magnetization and the geomagnetic main field (deg)	49
Declination of the initial magnetization and the geomagnetic main field (deg)	-7
Curie point depth (km)	5.5