

Geomagnetic three-component secular changes in eastern Hokkaido, NE Japan

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Based on the total field records, regional anomaly in the rate of geomagnetic secular changes have been observed in eastern Hokkaido, NE Japan (Oshima et al., 1994; Hashimoto et al., 2012). This area is under a compressive regime due to subduction of Pacific plate from east-southeast toward west-northwest (Ishikawa et al., 2001). Positive geomagnetic anomalies are also distributed in the southern coastal area, suggesting the existence of highly-magnetized rocks (Sugisaki et al., 2001). For these reasons, Nishida et al. (2004) suspected the piezomagnetic effect as the predominant cause of the rate of geomagnetic secular changes. We started three-component absolute measurements at eight continuous magnetic stations in 2009, aiming at revealing the mechanisms of the anomaly. The measurements have been performed twice or three times at each station by 2014. We report a brief overview of the absolute measurements up to 2014.

In the total field, the values at each station have been subtracted from values at the reference station Memambetsu Magnetic Observatory (MMB) of Japan Meteorological Agency to remove the variations of extra-terrestrial origins. We applied the same procedure also to declination, horizontal and vertical components. We then recognized that the rate of secular change in individual component also differs from site to site. Now, it is clear that the anomalous secular changes in the total field in this area were not brought by the so-called orientation effect. Trends of horizontal and vertical components were steeper near the southern coast as in the case of the total field. Declination seemed more complicated, presumably showing clockwise rotation in the northern area, while anti-clockwise in the south.

Current results are still preliminary because the number of absolute measurements is small yet. It is necessary to add further data in order to make the discussion more accurate. In addition, numerical modeling of piezomagnetic effect in three-component will contribute to constrain the mechanism of the anomaly.

Keywords: geomagnetic three-component absolute measurements, geomagnetic secular change, eastern Hokkaido