On the Magnetic Anomaly and its Time Change inside of a Geomagnetic Absolute Observation Room

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It is desirable that a distribution of magnetic field in a geomagnetic absolute observation room is constant, as much as possible, for accurate observation of secular variations. However, a deep dug ground for setting up stable pillars generates a magnetic anomaly around the observation house. Though we regard the anomaly is fixed for long time, we think we need to check the anomaly repeatedly, because the long-time stability of the magnetization of the returned soil is not clarified enough. We report an investigation result on the magnetic anomaly in the absolute observation room at the Kanoya Magnetic Observatory, and discuss about the stability of the anomaly.

A newly designed absolute observation house of the Kanoya Magnetic Observatory was built in 1995. The house is made by wood; copper-plates are using for the roof. Three pillars, made by non-magnetic granite, were installed at the central position of the room. Two months after the completion of the house, in June 1995, we conducted a magnetic survey in the room by a proton magnetometer. The horizontal grid size was one meter, and we measured at two levels, 1.5m from floor level (2.5m from ground level) and 2.2m(3.2m), respectively. As a result, we found a relatively large magnetic anomaly, of which amplitude is about 20 nT at height of 1.5m, spread out entirely over the room. Since there was not such a magnetic anomaly before the construction, it can regard that the anomaly was caused by the construction of the house.

A rectangular prism hole, 2m long(N-S), 10m wide(E-W) and 2m depth, was dug for setting up the three pillars. And then, the dug soil was returned to the same hole. We supposed that the magnetic anomaly has been caused by a demagnetization of the returned soil. To confirm this assumption, we made a computation of the magnetic anomaly by using a shape model of the dug ground. As a computational result, we could make a confirmation the propriety of the assumption.

Nine years after the first survey, in August 2004, we made the second survey to check a status of the magnetic field in the room. As a result, the anomaly was almost the same as the first survey. In detail, some slight differences, which are less than 1 nT, are detected. To check the differences, we conducted the third survey in March 2005. The distribution of the magnetic field by the third survey was close to the first one.

Although the investigation is not enough to discuss the time change of the magnetic anomaly, now we think the small differences observed at the second survey are explained by a slight thermal demagnetization of shallow part of soil around the absolute observation house.