# 地磁気観測所構内土壌の磁気的性質と地磁気観測値への影響

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# Magnetic properties of soil in the JMA magnetic observatories and its relevance to geomagnetic observation

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Baseline values of fluxgate magnetometers installed at three JMA magnetic observatories, which are measured once a week to obtain absolute geomagnetic values from observed geomagnetic variations, display annual variations with a maximum amplitude of 5 nT and in phase with ground temperature variations at a depth of 1 – 2 m. A possible origin of annual variations is change in magnetization of soil due to change in ground temperature. In order to examine the effect of the temperature change on soil magnetization, we measured magnetic properties of soil samples collected from the observatories. Induced magnetization of soil samples in a magnetic field of 0.05 mT ranged within 0.05 – 1.7 x $10^{-3}$ $Am^2/kg$ and temperature dependence of magnetization ranged within 0.3 – 14 x $10^{-6}$ $Am^2/kg$ K, except for a highly magnetic sample which was collected from a depth of 4 m in Memambetsu Observatory. Based on the measured magnetization and its temperature dependence of samples from Memambetsu, which shows the largest values among the samples from the three observatories, we estimated the distribution of geomagnetic field and its annual variation produced by soil magnetization. Estimated maximum amplitude of annual variation in geomagnetic field is 7 nT, which is consistent with the observed annual variation in baseline value of magnetometers.

気象庁地磁気観測所 (柿岡本所・女満別観測施設・鹿屋観測施設) ではフラックスゲート磁力計による地磁気変化観測値を絶対値化するために，週 1 回の絶対観測によって基線値を求めている．フラックスゲート磁力計の基線値は最大 5 nT 程度の振幅をもち，深度 1–2 m の地中温度変化と同位相の年周変化がみられる．年周変化の原因の一つとして，土壌温度の変化による磁化強度の変化が考えられる．この影響を評価するため，各観測所構内から土壌試料を採取し，磁気的性質を測定した．磁場 0.05 mT 中での誘導磁化強度は 0.05 – 1.7 x $10^{-3}$ $Am^2/kg$，その温度変化率は 0.3 – 14 x $10^{-6}$ $Am^2/kg$ K であった (ただし，女満別観測施設の地下 4 m から採取した 1 試料のみこの範囲を越えた)．磁化強度やその温度変化率が最も大きかった女満別試料の測定値を用いて，土壌磁化を原因とする地上での磁場分布とその年周変化を見積もった．見積もられた年周変化の振幅は最大 7 nT で，この値は観測された基線値年周変化の振幅と整合的であった．